



# **Early Alert Systems Using Learning Analytics to Determine and Improve Student Engagement and Academic Success in a Unit: Student and Teacher Perspectives**

By

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of the requirements for the degree of  
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# Statement of Candidate

I certify that this thesis entitled *Early Alert Systems Using Learning Analytics to Determine and Improve Student Engagement and Academic Success in a Unit: Student and Teacher Perspectives* has not been previously submitted for a degree nor has it been submitted as part requirement for a degree to any other university or institution other than Macquarie University.

I also certify that the thesis is an original piece of research and it has been written by me (Amara Atif). Any help and assistance that I have received in my research work and the preparation of the thesis itself have been appropriately acknowledged.

In addition, I certify that all information sources and literature used are indicated in the thesis.

The research presented in this thesis was approved by the Human Research Ethics Committee, Macquarie University with reference number: 5201300866 and 5201500031. A copy of the final ethics approval letter can be found in Appendix A.

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# **Dedication**

This work of mine is dedicated to:

My parents, Zarina and the late Mulazim Hussain, whom I love and respect deeply.

Their life and kindness are an inspiration to me.

# Acknowledgments

Praise to God, who in His infinite wisdom and benevolence, enabled me to undertake and complete this task despite my weaknesses and human limitations.

The writing of this dissertation has been one of the most significant academic challenges, I have ever had to face. Though only my name appears on the cover of this dissertation, a great many people have contributed to its production. I owe my gratitude to all those people who have made this dissertation possible and because of whom my higher degree research experience has been one that I will cherish forever.

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# Abstract

Given the focus on boosting retention rates and the potential benefits of proactive and early identification of students who may require support, higher education institutions are looking at the data already captured in university systems. The student early alert system is a formal, proactive, early intervention communication system that institutions have put into place to help with the timely identification (alert) and intervention of at-risk students. The significance of student early alert systems is that support could be offered to high-risk students while they are still enrolled in the unit and able to influence their success/failure before the unit completes. Delivering timely interventions to students via a student early alert system typically requires teaching staff to identify at-risk students, and act upon that information in a way that would encourage students to change their behaviours. The research in this thesis carefully investigates the students' and teachers' perceptions on the use of learning analytics tool to identify disengaged students/at-risk students and/or suggest intervention/s using student early alert systems. Furthermore, this thesis draws on the existing student success and retention literature to build a student engagement and academic success (SEAS) conceptual framework that incorporates teacher and student perspectives to early alert systems.

The specific research questions explored in this thesis are: What are the opinions and preferences of students with respect to early alerts? How do students respond (attitude) to receiving an early alert/intervention? Do students report change in behaviour for how they studied for a unit, if they actually receive an early alert? Do early alerts increase student performance and motivation to continue in the unit? Do early alert notifications increase student motivation to utilise the campus student support services? What are the perceptions of teachers with respect to early alerts? What information would the teaching staff find meaningful to include in a student early alert system? What are the potential barriers to early alert system usage? What are the experiences and motivations of teachers with regard to usage, helpfulness and barriers/challenges to the use of a prototype early alert system?

This PhD project followed mixed methods design to answer the above research questions. The research was undertaken in the form of two studies: 'student perspective' study and 'teacher perspective' study. Then, results from both studies

were compared and interpreted. By using mixed methods design, this thesis has the potential to achieve the respondent group triangulation (students and teachers) in empirical evidence and to overcome some of the limitations within singular methods.

The main contributions of this thesis are: (1) development of a theoretical framework to understand the perspectives of students and teachers regarding early alerts; (2) the development and use of ‘exploratory instruments’ for investigating the opinions and preferences of students on their attitudes towards the interventions and perceptions of teachers with respect to early alert process, and advantages and limitations to the use of early alert systems; and (3) development of a student engagement and academic success (SEAS) conceptual framework at the unit level.

This study offers implications and recommendations for administrators, department, faculty, and institutions focused on utilising early alert systems as a retention tool. Study findings contribute to the body of knowledge on the future use and application of learning analytics tools such as early alert process, support and interventions based on the student and teacher perspectives.

# Publications

Results of the research work leading to this PhD thesis have been published in various conferences. Presentations have been given at national and international conferences:

1	Title	A learning analytics pilot in Moodle and its impact on developing organisational capacity in a university
	Publication Details	Froissard, J-C., Liu, D., Richards, D., & Atif, A. (2017). <i>A learning analytics pilot in Moodle and its impact on developing organisational capacity in a university</i> . In H. Partridge, K. Davis, & J. Thomas. (Eds.), <i>Me, Us, IT! Proceedings ASCILITE2017: 34th International Conference on Innovation, Practice and Research in the Use of Educational Technologies in Tertiary Education</i> (pp. 73-77).
	Contribution to the Paper	Co-author. Helped to edit the manuscript.
	Overall percentage (%)	15%
2	Title	Benefits and challenges of using a Student Early Alert System: The Teacher's Perspective
	Publication Details	Atif, A., and Richards, D. (2016). <i>Benefits and challenges of using a Student Early Alert System: The Teacher's Perspective (Extended Abstract)</i> , in Charles A. Shoniregun & Galyna A. Akmayeva (Eds.), <i>Proceedings of the Ireland International Conference on Education (IICE)</i> , pp. 37, Dublin, Ireland. Available at <a href="http://www.iicedu.org/IICE-2016-October/IICE-2016-Proceedings.pdf">http://www.iicedu.org/IICE-2016-October/IICE-2016-Proceedings.pdf</a>
	Contribution to the Paper	Principal author. Wrote the manuscript.
	Overall percentage (%)	90%
3	Title	Knowledge Acquisition for Learning Analytics: Comparing Teacher-Derived, Algorithm-Derived, and Hybrid Models in the Moodle Engagement Analytics Plugin
	Publication Details	Liu, D., Richards, D., Dawson, P., Froissard, C., and Atif, A. (2016). <i>Knowledge Acquisition for Learning Analytics: Comparing Teacher-Derived, Algorithm-Derived, and Hybrid Models in the Moodle Engagement Analytics Plugin</i> , Pacific Rim Knowledge Acquisition (PKAW) Workshop, Phuket, Thailand. Springer International Publishing. Available at <a href="http://link.springer.com/chapter/10.1007/978-3-319-42706-5_14">http://link.springer.com/chapter/10.1007/978-3-319-42706-5_14</a>
	Contribution to the Paper	Co-author. Helped to edit the manuscript.
	Overall percentage (%)	15%

4	Title	Student Preferences and Attitudes to the Use of Early Alerts
	Publication Details	Atif, A., Richards, D., and Bilgin, A. (2015). <i>Student Preferences and Attitudes to the Use of Early Alerts</i> . Paper presented at the 21st Americas Conference on Information Systems (AMCIS) (A-Ranked): Blue Ocean Research, Puerto Rico. Available at: <a href="http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1297&amp;context=amcis2015">http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1297&amp;context=amcis2015</a>
	Contribution to the Paper	Principal author. Wrote manuscript, performed analysis, interpreted data and acted as corresponding author.
	Overall percentage (%)	75%
5	Title	Validating the Effectiveness of the Moodle Engagement Analytics Plugin (MEAP) to Predict Student Academic Performance
	Publication Details	Liu, D., Froissard, C., Richards, D., and Atif, A. (2015). <i>Validating the Effectiveness of the Moodle Engagement Analytics Plugin to Predict Student Academic Performance</i> . Paper presented at the 21 <sup>st</sup> Americas Conference on Information Systems (AMCIS) (A-Ranked): Blue Ocean Research, Puerto Rico. Available at: <a href="http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1290&amp;context=amcis2015">http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1290&amp;context=amcis2015</a>
	Contribution to the Paper	Co-author. Helped to edit the manuscript.
	Overall percentage (%)	15%
6	Title	An Enhanced Learning Analytics Plugin for Moodle-Student Engagement and Personalised Intervention
	Publication Details	Liu, D., Froissard, C., Richards, D., and Atif, A. (2015). <i>An Enhanced Learning Analytics Plugin for Moodle-Student Engagement and Personalised Intervention</i> . Paper presented at the Australasian Society of Computers in Learning in Tertiary Education (ASCILITE): Globally Connected, Digitally Enabled, Perth, Western Australia. Available at: <a href="http://www.2015conference.ascilite.org/wp-content/uploads/2015/11/ascilite-2015-proceedings.pdf">http://www.2015conference.ascilite.org/wp-content/uploads/2015/11/ascilite-2015-proceedings.pdf</a>
	Contribution to the Paper	Co-author. Helped to collect (unit convenor interview), analyse and interpret data. Helped to edit the manuscript.
	Overall percentage (%)	25%

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	Contribution to the Paper	Principal author. Took the lead and wrote manuscript, developed the proposed model and acted as corresponding author.
	Overall percentage (%)	85%
8	Title	Learning Analytics in Higher Education: A Summary of Tools and Approaches
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	Contribution to the Paper	Principal author. Draft the manuscript, studied the exemplar tools, performed the conceptual analysis of the sample learning analytic tools and acted as corresponding author.
	Overall percentage (%)	85%

The ranking mentioned in the above table are by CORE (the Computing Research and Education association of Australia) and ACPHIS, the academic associations in Australia for Computer Science and Information Systems.

# Table of Contents

1	Chapter: Introduction .....	1
1.1	Introduction .....	1
1.2	Institutional Perspective - Context .....	5
1.3	Motivation for this Research .....	8
1.4	The Theoretical Framework as a Conceptual Lens .....	11
1.5	Research Objectives and Questions.....	13
1.6	Overview of the Chosen Research Methodology .....	14
1.7	Research Intended Contributions.....	15
1.7.1	Theoretical Framework .....	15
1.7.2	Understanding Student Perspective.....	16
1.7.3	Understanding Teacher Perspective - Barriers to Usage.....	16
1.7.4	SEAS Conceptual Framework .....	16
1.7.5	Other Contributions.....	16
1.7.5.1	Recommendations to Institutions .....	16
1.7.5.2	Validated Prototype Student Early Alert System (MEAP) .....	16
1.8	Research Scope and Delimitations .....	17
1.8.1	Not About Algorithms or Tool Usability or Acceptance .....	17
1.8.2	Restricted to Learning Analytics.....	18
1.8.3	Restricted to Unit-Level Data .....	18
1.8.4	Restricted to One Institution .....	19
1.9	Thesis Outline.....	20
2	Chapter: Literature Review .....	21
2.1	Introduction .....	21
2.2	Student Engagement, Retention and Academic Success in Higher Education.....	21
2.2.1	Student Engagement.....	22

2.2.2	Student Retention .....	24
2.2.3	Student Engagement/Retention Theories and Models .....	26
2.2.3.1	Vincent Tinto's Theory of Student Departure.....	27
2.2.3.2	John Bean's Explanatory Theory of Student Retention .....	28
2.2.3.3	Alexander Astin's Theory of Student Involvement .....	28
2.2.3.4	Swail Watson's Geometric Model of Student Persistence and Achievement .....	29
2.2.4	Factors Contributing to Student Engagement and Academic Success 29	
2.2.4.1	Student Expectations and Perceptions of Academic Study .....	30
2.2.4.2	Academic Preparation and Performance.....	31
2.2.4.3	Learning and Teaching in an Online Environment.....	33
2.2.4.4	Interventions (Feedback) in Online Units .....	33
2.2.4.5	Student Support Services.....	34
2.2.5	The Theoretical Framework for this Study .....	36
2.3	Analytics in Higher Education.....	37
2.3.1	Educational Data Mining.....	38
2.3.2	Academic Analytics .....	39
2.3.3	Learning Analytics .....	39
2.3.3.1	Learning Analytics Definition .....	40
2.3.3.2	Learning Analytics Processes, Models or Frameworks .....	41
2.3.3.3	Learning Analytics Benefits.....	41
2.3.3.4	Learning Analytics Challenges.....	45
2.4	Early Intervention in Higher Education.....	47
2.4.1	Early Alert Systems/Tools.....	47
2.4.1.1	International Case Studies .....	49
2.4.1.1.1	Purdue University, North America - Course Signals .....	49
2.4.1.1.2	Baylor University, North America - Academic Referral System.....	51
2.4.1.1.3	Northern Arizona University, US - Grade Performance Status (GPS) 53	
2.4.1.1.4	University of Michigan, US - E <sup>2</sup> Coach .....	54
2.4.1.1.5	The Open University, UK - OU Analyse .....	54
2.4.1.2	Australian Case Studies.....	55

2.4.1.2.1	University of New England (UNE), NSW - Automated Wellness Engine (AWE).....	56
2.4.1.2.2	Edith Cowan University (ECU), WA - Connect for Success (C4S).....	57
2.4.1.2.3	Queensland University of Technology (QUT), Queensland - The Student Success Program (SSP).....	59
2.4.1.2.4	Open University Australia (OUA) - Personalised Adaptive Study Success (PASS).....	60
2.4.1.2.5	University of New South Wales, NSW – Student Academic Risk (SAR) Report .....	61
2.4.1.3	Other Case Studies – Commercial Providers.....	61
2.4.1.4	Tool Comparison .....	62
2.5	Summary.....	64
3	Chapter: Research Design and Methodology.....	66
3.1	Introduction .....	66
3.2	The Research Design .....	66
3.2.1	Research Philosophy - Epistemology.....	67
3.2.2	Methodical Choice - Mixed Methods.....	68
3.2.3	Research Strategy - Exploratory Case Study .....	69
3.2.4	Time Horizon – Cross-Sectional .....	71
3.2.5	Research Techniques and Procedures .....	72
3.3	Mixed Methods Research – Validity and Reliability .....	74
3.4	The Research Site .....	74
3.5	Organisational Context of the Macquarie University.....	76
3.6	IT Systems Used at Macquarie University .....	78
3.6.1	AMIS (The Student Information System).....	78
3.6.2	Tracker (CRM).....	79
3.6.3	The Moodle iLearn (online LMS).....	79
3.7	Early Alert System Usage at Macquarie University.....	80
3.8	Identifying Data at Macquarie University Related to Student Success Factors .....	83

3.9	Summary .....	86
4	Chapter: The Student Perspective Study .....	87
4.1	Introduction.....	87
4.2	Case Studies: An Overview .....	88
4.3	Student Perspective Study Design .....	91
4.3.1	Participants .....	91
4.3.2	Data Collection Method and Materials .....	91
4.3.3	Questionnaire Development.....	93
4.3.3.1	Questionnaire Content and Structure .....	95
4.3.3.2	Scale Development .....	104
4.3.4	Instrument Validity and Reliability .....	104
4.3.5	Ethical Considerations.....	113
4.4	Pilot Study: December 2013-January 2014 .....	114
4.4.1	Procedure of Pilot Study.....	114
4.4.2	Results of Pilot Study .....	116
4.4.3	Reflections from the Pilot Study .....	124
4.5	Case Study 1: Session 1 (March 2014 – July 2014) .....	125
4.5.1	Design and Procedure of Case Study 1 .....	125
4.5.2	Results of Case Study 1 .....	126
4.5.3	Summary and Reflections from the Case Study 1 .....	133
4.6	Case Study 2: Session 1 (May 2014 – July 2014) .....	134
4.6.1	Design and Procedure of Case Study 2 .....	134
4.6.2	Results of Case Study 2.....	135
4.6.3	Summary and Reflections from the Case Study 2.....	145
4.7	Case Study 3: Session 1 (March 2015-June 2015) .....	146
4.7.1	Design and Procedure of Case Study 3 .....	147
4.7.2	Results of Case Study 3 .....	148

4.7.3	Summary and Reflections from the Case Study 3.....	156
4.8	The Final Study (Case Study 4): Session 2 (August 2015 – Nov 2015)	157
4.8.1	Design and Procedure of the Final Study.....	157
4.8.2	Non-Response Bias .....	159
4.8.3	Results from the Final Study .....	162
4.8.3.1	Student Demographics .....	162
4.8.3.2	Opinions and Preferences of Students with Respect to Early Alerts ..	165
4.8.3.2.1	Would students like to be contacted if their performance in the unit is unsatisfactory? .....	166
4.8.3.2.2	When students like to be contacted? .....	166
4.8.3.2.3	For what specific behaviours students like to be contacted? .....	167
4.8.3.2.4	In the future, how would you like to be advised about opportunities to seek assistance? .....	168
4.8.3.2.5	From the following strategies, which do you think would motivate you to seek help? .....	168
4.8.3.2.6	Ethical Considerations - Students Consent to the Use of their LMS Data	169
4.8.3.3	Unit Specific Information.....	170
4.8.3.4	Attitude of Students Receiving an Early Alert/Intervention .....	173
4.8.3.4.1	Did you follow-up or take any action as a result of the early alert notice?	173
4.8.3.4.2	What specific action(s) did you take when you were first contacted by an early alert notice? .....	173
4.8.3.4.3	What was your attitude towards being contacted via an early alert notice?	174
4.8.3.4.4	What is your attitude toward interventions and academic standing in the unit? .....	175
4.8.3.5	Intervention Impact on Change in Behaviour for How Students' Study for a Unit	176
4.8.3.5.1	Actions(s) advised to students' VS Actions(s) students' actually took	176
4.8.3.5.2	Did receiving an email from your unit convenor change how you studied for this unit? .....	176
4.8.3.5.3	Do you think that receiving emails like this helped you to learn and do better in your unit? .....	177

4.8.3.5.4	Now that you have received email(s) from your unit convenor, what would be the impact on you if you no longer received emails in other units?	178
4.8.3.6	Intervention Impact on Student Performance and Motivation to Continue in the Unit.....	178
4.8.3.6.1	What impact did receiving an email from your unit convenor have on your motivation to continue in the unit? .....	178
4.8.3.6.2	What impact did receiving an email have on how you viewed your unit convenor? .....	189
4.8.3.7	Intervention Impact to Increase Student Motivation to Utilise the Campus Support Services .....	191
4.8.3.7.1	Were you advised to seek help from teaching or any student support services? .....	191
4.8.3.7.2	Which student support services from the campus wellbeing were you advised to visit? .....	191
4.8.3.7.3	Did the early alert notice provide you with campus student support services that you did not previously know about? .....	192
4.8.3.7.4	What is student attitude towards campus wellbeing services at Macquarie University relevant to the unit?.....	192
4.8.3.7.5	How satisfied are you with the contact you received from the teaching or student support staff about your progress?.....	193
4.8.3.8	Behavioural Analysis of Students Before and After Receiving an Early Alert or Intervention Email .....	193
4.8.3.8.1	Group 1: Students who did not receive an alert .....	195
4.8.3.8.2	Group 2: Students who received an alert/intervention .....	196
4.9	Student Perspective Discussion .....	201
4.10	Summary .....	207
5	Chapter: The Teacher Perspective Study .....	209
5.1	Introduction.....	209
5.2	Teachers' Perspective Study-Mixed Methods Sequential Exploratory Design.....	210
5.2.1	Ethical Considerations.....	212
5.3	Illustrative Study-A Prototype Student Early Alert System.....	213
5.4	Qualitative Data Collection and Analysis (Stage 1A) .....	217
5.4.1	Interview Guide Development and Pilot Testing .....	217

5.4.2	The Use of Thematic Analysis .....	218
5.4.2.1	Assessing Qualitative Validity .....	221
5.4.2.1.1	Confirmability .....	221
5.4.2.1.2	Credibility .....	221
5.4.2.1.3	Transferability .....	221
5.4.2.1.4	Dependability .....	222
5.4.2.2	Assessing Inter-Coder Reliability .....	222
5.5	Quantitative (Survey Interview) Data Collection and Analysis (Stage 1B) 222	
5.6	Results .....	223
5.6.1	Qualitative Phase: Stage 1A .....	223
5.6.2	Quantitative Phase: Stage 1B .....	229
5.7	Triangulation between the Teacher Perspective Data Sources .....	233
5.8	Discussion of the Teachers' Perspective .....	233
5.9	Summary .....	236
6	CHAPTER: CONCEPTUAL STUDENT ENGAGEMENT AND ACADEMIC SUCCESS (SEAS) FRAMEWORK .....	238
6.1	Introduction .....	238
6.2	The Discussion and Comparison of Student-Teacher Perspectives .....	238
6.3	Derivation of the Elements Included in the Conceptual Framework ...	241
6.3.1	The Elements of the Conceptual Framework .....	242
6.3.1.1	The Unit Environment .....	242
6.3.1.2	Learning Analytics at the Unit-Level .....	243
6.3.1.2.1	Ethics of Accessing and Using Student Data .....	243
6.3.1.3	The Drivers of Student Success at Unit-Level .....	244
6.3.1.3.1	Understand Expectations and Engagement .....	247
6.3.1.3.2	Skills and Abilities .....	248
6.3.1.3.3	Student-Teacher Interaction/Support .....	249
6.3.1.3.4	Helpfulness of Student Support Services .....	250
6.4	Conceptual Student Engagement and Academic Success Framework (SEAS) .....	251

6.5	Summary.....	253
7	CHAPTER: MOODLE ENGAGEMENT ANALYTICS PLUGIN (MEAP+) NOW .....	254
7.1	Introduction.....	254
7.2	Impact of MEAP+ on Developing Organisational Capacity at Macquarie University .....	255
7.3	MEAP+ Now .....	259
7.3.1	Student Learning, Engagement and Experience.....	260
7.3.1.1	Enhanced Convenor Capability to Better Support Students .....	260
7.3.1.2	Enhanced Convenor Capability to Improve the Student Learning Environment .....	261
7.3.1.3	MEAP+ Recognition.....	263
7.4	Case Study 5: Session 2 (Oct 2017 – Dec 2017) .....	264
7.4.1	Design and Procedure of Case Study 5 .....	264
7.4.2	Results of Case Study 5.....	265
7.4.3	Discussion .....	270
7.5	Summary.....	271
8	CHAPTER: CONCLUSIONS, RECOMMENDATIONS AND FUTURE WORK.....	272
8.1	Introduction.....	272
8.2	Research Review .....	272
8.3	Summary of Contributions .....	276
8.3.1	Theoretical Framework .....	276
8.3.2	Understanding the Student Perspective.....	277
8.3.3	Understanding Teacher Perspective - Barriers to Usage.....	277
8.3.4	Student Engagement and Academic Success (SEAS) Conceptual Framework.....	277
8.4	Answering the Research Questions .....	278

8.5	Limitations and Future Work .....	279
8.5.1	Theoretical Limitations .....	279
8.5.2	Data Limitations .....	280
8.5.3	Technical Limitations.....	281
8.5.4	Practical Limitations .....	281
8.5.5	Future Research.....	282
8.6	Practical Implications and Recommendations.....	282
8.6.1	Administrators, Educational Leaders and Senior Executives .....	283
8.6.2	Teachers (Unit Convenors) .....	283
8.6.3	Student support officers .....	288
8.6.4	Program Directors .....	288
8.6.5	Summary of Recommendations for Future Versions or Adaptation of the Surveys .....	289
8.7	Closing Remarks.....	290
	References .....	292
	Appendix A .....	315
	Appendix B .....	318
	Appendix C .....	322
	Appendix D .....	332
	Appendix E.....	333
	Appendix F.....	351
	Appendix G .....	390
	Appendix H .....	404
	Appendix I.....	412
	Appendix J.....	420

# Table of Tables

Table 2.1: Student Retention Behaviours .....	25
Table 2.2: Synthesis of Key Concepts Addressed in Theoretical Framework for this Study.....	37
Table 2.3: Learning Analytics Definitions .....	40
Table 2.4: Learning Analytics Theoretical Contributions.....	42
Table 2.5: Challenges of Learning Analytics .....	46
Table 2.6: Summary of Tools.....	63
Table 3.1: Macquarie University's Moodle LMS (iLearn) .....	80
Table 3.2: Factors critical to student engagement and success at Macquarie University (MQ) .....	84
Table 4.1: Timeline and Overview of Pilot and Case Studies.....	90
Table 4.2: Student survey items corresponding to other national and international surveys.....	100
Table 4.3: Factor loadings of the Final case study (Case Study 4) questionnaire .....	106
Table 4.4: Cronbach's Alpha ( $\alpha$ ) Coefficients for Skills/Abilities, Motivation, Expectations and Attitudes .....	110
Table 4.5: KR-20 Coefficients for actions student took as a result of early alert notice in Pilot Study .....	112
Table 4.6: Pilot Study-Triggers identified by the unit convenor.....	115
Table 4.7: Pilot Study-Student Demographics .....	117
Table 4.8: Pilot Study-If, when, why and how to be sent alerts* .....	120
Table 4.9: Case Study 1-Triggers identified by the unit convenors.....	126
Table 4.10: Case Study 1-Student Demographics.....	127
Table 4.11: Case Study 1-If, when, why and how to be sent alerts* .....	130
Table 4.12: Case Study 2- Student Demographics.....	136

Table 4.13: Case Study 2-Mean and Standard Deviation (SD) values for student skills and abilities (QIV.7) (N=67 except for Programming ability and Interpersonal skills where N=66) .....	142
Table 4.14: Case Study 2-Factors affecting student performance in the respective unit (QIV.12).....	144
Table 4.15: Case Study 3-Student Demographics.....	149
Table 4.16: Case Study 3-Factors that can affect students' academic performance (QII.10b, N=459).....	151
Table 4.17: Case Study 3-If, when, why and how to be sent alerts * .....	152
Table 4.18: Time trends of responses and cumulative responses .....	161
Table 4.19: Comparison of Early Respondents and late respondents/Non-Respondents .....	162
Table 4.20: Final Study-Student Responses Unit Wise .....	163
Table 4.21: Final Study-Student Demographics .....	164
Table 4.22: Final Study-Frequencies and Percentages of Participants' Demographics.....	165
Table 4.23: Final Study-When students like to be contacted* .....	167
Table 4.24: Final Study-For what specific behaviours students want to be contacted* .....	167
Table 4.25: Final Study-How students want the alerts to take? * .....	168
Table 4.26: Final Study-Students' preferences for seeking help * .....	169
Table 4.27: Final Study-Mean and Standard Deviation (SD) values for student skills and abilities (N=595).....	171
Table 4.28: Final Study-Unit Preparedness.....	172
Table 4.29: Final Study- Mean and Standard Deviation (SD) values for student motivation (N=595).....	172
Table 4.30: Final Study-Specific actions students take when they were first contacted (N=64)* .....	174

Table 4.31: Final Study-Mean and Standard Deviation (SD) values for student attitude towards being contacted (N=86) .....	174
Table 4.32: Final Study- Mean and Standard Deviation (SD) values for student attitude towards interventions and academic standing in a unit (N=86) .....	175
Table 4.33: Final Study-Change in behaviour how a student studies after receiving an email from the unit convenor (N=76) * .....	177
Table 4.34: Final Study-Intervention impact on student learning (N=84) * .....	177
Table 4.35: Outcome/Target variable.....	179
Table 4.36: Variables identified as important factors by the three Decision Trees .....	180
Table 4.37: Accuracy matrix for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Better” .....	182
Table 4.38: The variable importance for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Better” .....	183
Table 4.39: Accuracy matrix for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Like Improved” .....	184
Table 4.40: The variable importance for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Like Improved” .....	185
Table 4.41: Accuracy matrix for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Worse” .....	187
Table 4.42: The variable importance for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Worse” .....	187
Table 4.43: Final Study-Mean and Standard Deviation (SD) values for intervention impact on student on how they view their unit convenor (N=84).....	189
Table 4.44: Final Study-Student support services advised to visit (N=84) * .....	192
Table 4.45: Final Study-Student’s attitude towards Campus Wellbeing services (N=84) * .....	193
Table 4.46: Data selection for the three indicators.....	194

Table 4.47: Group 2-Student 1 Indicators Hits Summary Before and After the Intervention Emails .....	198
Table 4.48: Group 2-Student 2 Indicators Hits Summary Before and After the Intervention Email.....	200
Table 5.1: Thematic analysis steps for this study. Adapted from Braun and Clarke (2006) .....	219
Table 5.2: Kappa coefficient values and value of agreement between the researchers .....	224
Table 5.3: Main themes and sub-themes from semi-structured interviews.....	225
Table 5.4: Sample Quotes for Sub-Themes (1st Order) ‘Motivation’ showing the Sub-Themes (2nd Order).....	226
Table 5.5: Sample Quotes for Sub-Themes (1st Order) ‘Barriers/Challenges’ showing the Sub-Themes (2nd Order) .....	227
Table 5.6: Sample Quotes for Sub-Themes (1st Order) ‘Engagement Triggers/Identifiers’ showing the Sub-Themes (2nd Order).....	227
Table 5.7: Sample Quotes for Sub-Themes (1st Order) ‘Actions’ showing the Sub-Themes (2nd Order) .....	228
Table 5.8: Summary of respondents’ demographics .....	230
Table 5.9: Actions/support suggested by teaching and support staff as part of the early intervention.....	232
Table 7.1: Summary of Organisational Capacity for Macquarie University .....	256
Table 7.2: Case Study 5-Student Demographics.....	266
Table 7.3: Case Study 5-Frequency of students for what specific behaviours do they want to be contacted .....	267
Table 7.4: Case Study 5-Respondent Self-reported Early Alert Notification Received.....	268
Table 7.5: Case Study 5-Specific actions students take when they were first contacted.....	268

# Table of Figures

Figure 2.1: Benefits of Learning Analytics for Stakeholders.....	45
Figure 2.2: Faculty view of the Course Signals Dashboard .....	50
Figure 2.3: Baylor’s University Academic Referral System.....	52
Figure 2.4: Faculty view of the how to make a referral .....	52
Figure 2.5: Northern Arizona University’s early alert process using GPS .....	53
Figure 2.6: E <sup>2</sup> Coach Process Model.....	54
Figure 2.7: The OU Analyse Dashboard .....	55
Figure 2.8: University of New England’s Automated Wellness Engine (AWE) ..	57
Figure 2.9: Proposed reporting and intervention sequence in C4S .....	57
Figure 2.10: Edith Cowan University’s C4S.....	58
Figure 2.11: Flow chart of the process of early alert at ECU.....	59
Figure 2.12: The SSP organisational processes.....	60
Figure 2.13: Open University Australia’s PASS view .....	61
Figure 3.1: Generic Research Process Onion. Adopted by Saunders et al. (2012)	67
Figure 3.2: The Research Process .....	73
Figure 3.3: A Snapshot of Macquarie University.....	75
Figure 3.4: Organisational Chart .....	77
Figure 3.5: Macquarie University IT Systems .....	78
Figure 3.6: Screenshot of original MEAP interface .....	81
Figure 3.7: Extended Generic Research Process Onion used in this research .....	86
Figure 4.1: Taxonomy of multi-dimensional constructs for the student survey....	95
Figure 4.2: Pilot Study-Introductory Email from Computing Study Buddy .....	115
Figure 4.3: Pilot Study-Mean and Standard Deviation values for student skills and abilities (QII.5) (N=25 except for Critical thinking skills and Interpersonal skills where N=24).....	118

Figure 4.4: Pilot Study-Factors that can affect students' academic performance (QII.10b, N=12).....	119
Figure 4.5: Case Study 1- Mean (Standard Deviation) values for student skills and abilities (QII.5) (COMP1XX, N=5 and ISYS1XX, N=38).....	128
Figure 4.6: Case Study 1-Factors that can affect students' academic performance (QII.10b) (ISYS1XX, N=20 and COMP1XX, N=3) .....	129
Figure 4.7: Case Study 2-When students' like to be contacted? (QII.1) (N=63)	138
Figure 4.8: Case Study 2-When students like to be contacted? 'As soon as it occurs' .....	138
Figure 4.9: Case Study 2-For what specific behaviours students' like to be contacted? (QII.2) (N=67).....	139
Figure 4.10: Case Study 2-How students want the alerts to take? (QII.3) (N=65) .....	139
Figure 4.11: Case Study 2-Word Cloud for university support services students were aware of (QIII.2).....	141
Figure 4.12: Case Study 2-Student Motivation.....	143
Figure 4.13: Case Study 2-Student Expectations (QIV.13) .....	144
Figure 4.14: Case Study 2-Student Expectations from the teaching staff (QIV.14) .....	145
Figure 4.15: Case Study 3 Study- Mean and Standard Deviation values for student skills and abilities (QII.5) (N=1006 except for Competitiveness & Academic ability where N=1007 and Programming ability & Time management where N=1005)	150
Figure 4.16: Final Study-Understand the unit requirements .....	171
Figure 4.17: Final Study-Factors affecting student performance in the respective unit (N=595).....	172
Figure 4.18: Final Study-Student attitude towards being contacted (N=86).....	175
Figure 4.19: Final Study-A comparison between the actions students were advised to take and the actions they actually took after being contacted (N=80) .....	176
Figure 4.20: Decision Trees (stream) in SPSS Modeler .....	179

Figure 4.21: Decision tree for intervention impact on student motivation “feel better”. Mode 1=I feel better and Mode 0=I don’t feel better .....	183
Figure 4.22: Decision tree for intervention impact on student motivation “feel improve”. Mode 1=I feel like improved and Mode 0=I don’t feel improved .....	185
Figure 4.23: Decision tree for intervention impact on student motivation “feel worse”. Mode 1=I feel worse and Mode 0=I don’t feel worse.....	187
Figure 4.24: Final Study-Intervention impact on student on how they view their unit convenor .....	190
Figure 4.25: Number of LMS Interactions for the Two Students Who Did Not Receive an Alert (Group 1) .....	196
Figure 4.26: Number of LMS Interactions for Group 2-Student 1 Who Received an Alert.....	198
Figure 4.27: Number of LMS Interactions for Group 2-Student 2 Who Received an Alert.....	200
Figure 4.28: Comparative analysis of case studies regarding early alerts (whether a student wants to receive an early alert, when, how and in what form they want that alert to take).....	201
Figure 4.29: Comparative analysis of case studies of the possible factors that influenced students’ academic performance .....	203
Figure 5.1: Graphical representation of mixed methods sequential exploratory design (adopted from Creswell & Plano Clark, 2007) .....	210
Figure 5.2: A visual model of our mixed methods sequential exploratory design .....	212
Figure 5.3: A screenshot of the prototype student early alert system (MEAP)...	214
Figure 5.4: A screenshot of MEAP+ showing the indicators.....	214
Figure 5.5: Indicator Weightings.....	215
Figure 5.6: Assessment Activity Thresholds.....	215
Figure 5.7: Login Activity Thresholds .....	215
Figure 5.8: Gradebook Activity Thresholds.....	215

Figure 5.9: Forum Activity Thresholds.....	215
Figure 5.10: A screenshot of MEAP+ showing the mailer component .....	216
Figure 5.11: A screenshot of MEAP+ showing how to send an email from suggested snippets.....	216
Figure 5.12: The thematic map. Ellipses show the main themes, rectangular boxes show the 1st order sub-themes and rounded rectangular boxes show the 2nd order sub-themes.....	228
Figure 5.13: Expectations and/or engagement triggers/indicators to identify at-risk students.....	230
Figure 5.14: Challenges faced using the prototype system.....	231
Figure 6.1: The elements of the conceptual SEAS framework and their derivation to different chapters of the thesis .....	242
Figure 6.2: Proposed student engagement and academic success (SEAS) framework (within a single unit) .....	246
Figure 7.1: Different ways Students were contacted or received an intervention across all studies.....	255
Figure 7.2: Case Study 5-Factors affecting student performance in the respective unit.....	268

# Abbreviated Terms

Abbreviation	Term
ABS	Australian Bureau of Statistics
AMIS	Academic Management Information System
ANOVA	Analysis Of Variance
AUSSE	Australian Survey of Student Engagement
AWE	Automated Wellness Engine
CAQDAS	Computer Assisted Qualitative Data Analysis Software
DEEWR	Department of Education Employment and Workplace Relations
eCAF	Commonwealth Assistance Form
EDM	Educational Data Mining
ESOS	Education Services for overseas Students
FYFS	First Year First Semester
GPA	Grade Point Average
GPS	Grade Performance Status
GROP	Generic Research Onion Process
HECS	Higher Education Contribution Scheme
HEI	Higher Education Institute
HREC	Human Research Ethics Committee
IS	Information System
IT	Information Technology
JISC	Joint Information Systems Committee
LACE	Learning Analytics Community Exchange
LMS	Learning Management System
MEAP	Moodle Engagement Analytics Plugin
MEB	Moodle Engagement Block
MOOC	Massive Open Online Course
NMC	New Media Consortium
NSSE	National Survey of Student Engagement
OLT	Office of Learning and Teaching
SD	Standard Deviation
SEAS	Student Engagement and Academic Success
SIS	Student Information System
SMS	Short Messaging Service
SPSS	Statistical Package for Social Sciences
SSA	Student Success Algorithm
SST	Student Support Team
STEM	Science, Technology, Engineering and Mathematics
TMA	Tutor Marked Assessments
VLE	Virtual Learning Environment



# **1 CHAPTER: INTRODUCTION**

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## **1.1 Introduction**

Blended and online learning have provided students with increased access and flexibility to participate in education. However, online education comes with the risk of a disconnect (or disengagement) between teachers and their students with each largely remaining no more than a name or even a student number to the other. Furthermore, there is stimulating interest to further investigate when and on what factors the teaching staff rely upon to detect disengagement in the online context. The reduced contact with students makes it more difficult for teachers and institutions to manage student learning and measure the engagement of large numbers of students with the aim of retaining more students and improving student academic success rates (An 2015; Bryson 2016; Wintrup 2017). Just as these problems are the result of technology innovation, technology can be used to address these problems.

The widespread use of e-learning platforms such as learning management systems (LMSs) (for example, Moodle and Blackboard) accumulate a vast collection of student personal and academic data including interaction data between students, peers, instructors and content. Students' data in a LMS could also include comprehensive information on the number of students' discussion posts generated and read, the number of times a resource is accessed, date and time of access, participation and progress through a range of tasks. This voluminous information can be used to understand student engagement, teaching efficacy and the learning environment in which teaching is performed. Despite the availability of this enormous data, activity logs from LMS have been under-utilised (Phillips et al. 2012). Recently, this analysis of student's learning data has raised the interest of researchers and educational institutions to a new discipline and research area known as learning analytics (Ferguson 2012a; Ferguson 2012b).

Learning analytics is a relatively new but rapidly growing field since the term 'learning analytics' was used for the first time in 2010. Learning analytics is defined as, "the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimising learning, and the

environments in which it occurs” (Siemens & Long 2011, p. 34). The New Media Consortium (NMC) Horizon Report-2015 Higher Education Edition (Johnson, Becker, & Hall, 2015) recognised learning analytics to measure student learning over the next 3-5 years. Learning analytics can be used at various levels such as unit-level, program-level and institutional-level (Shum, Knight & Littleton 2012) where it incorporates the learning process which includes analysing the relationship between student, teacher, unit/course content and the institution. However, there is limited and often restricted use of learning analytics in most higher education institutions (HEIs) (Siemens, Dawson & Lynch 2013).

Learning analytics is a closely aligned field of educational data mining (EDM) and academic analytics (Baker & Inventado 2014; Siemens 2011). The concepts of EDM, learning analytics and academic analytics differ in terms of purpose and scope. Educational data mining is associated with the development of computational methods/tools for analysis of learning data such as to investigate patterns of student behaviour in a large data set (Baker & Yacef 2009; Hung, Hsu & Rice 2012; Romero & Ventura 2010). EDM is a more umbrella term that covers learning analytics as well as academic analytics. Learning analytics is conducted mostly at the learning and teaching level of an institution with a focus on the academic performance of individual students (Daniel 2015). Academic analytics, in contrast, refers to the application of the principles and tools of business intelligence to academia with the objective to improve an educational institution’s performance and decision making (Campbell, DeBlois & Oblinger 2007). Siemens indicated that academic analytics has more focus on analytics at institutional, regional and international levels (Siemens 2011).

Initial learning analytics research has typically focused on providing student engagement and performance data to HEIs, most commonly for the purpose of improving student performance and retention (Arnold & Pistilli 2012; Jayaprakash et al. 2014; Romero & Ventura 2013; Slade & Galpin 2012). Recently, this focus has been extended to include ways to understand students’ learning behaviours, identify and contact at-risk students, providing personalised learning experiences and timely interventions (Clow 2013; Gasevis, Dawson & Siemens 2015; Greller & Drachsler 2012; Pardo & Siemens 2014; Siemens & Long 2011). The glossary of Education Reform (<http://edglossary.org>) define the term ‘at-risk’ as, “students

or groups of students who are considered to have a higher probability of failing academically or dropping out of the institution”. There is much research interest in and attention given to algorithms (correlational models and predictive analytics) and the use of data mining for the analysis and presentation of data concerning students (Essa & Ayad 2012a; Gašević et al. 2016; Papamitsiou & Economides 2014; Wolff et al. 2013) and discussion of issues around the ethics of accessing and using student data (Gasevic, Dawson & Jovanovic 2016; Ifenthaler & Tracey 2016; Pardo & Siemens 2014; Rubel & Jones 2016; Slade & Prinsloo 2013; Willis, Campbell & Pistilli 2013).

Research studies (Danilowicz-Gösele et al. 2017; Dweck, Walton & Cohen 2014; Gašević et al. 2016; Jayaprakash et al. 2014; Singell & Waddell 2010) have shown that the earlier a student is identified as possibly being in need of support, the better the opportunity they have to improve their academic performance. To provide this early identification, one popular approach is the use of an academic early alert system (Lynch-Holmes, Troy & Ramos 2012). The academic or student early alert system is a formal, proactive, early intervention communication system institutions have put into place to help with the timely identification (alert) and intervention of at-risk students. From this perspective, and in line with Johnson (2015) and Gasevic et al.(2015), we can say that a student early alert system is a learning analytics system/tool to identify students who are potentially at risk of failing or withdrawing from their studies. Providing a similar perspective, Macfadyen and Dawson (2010) present an ‘early warning system’ as a learning analytic tool which measures student engagement and academic success using LMS generated student data for identifying students who are not interacting with the online unit material. Both researchers concluded that the use of learning analytics in their study accurately predicted 81% of students who earned a ‘fail’ grade. Therefore, both perspectives of a student early alert system i.e. identification of ‘at-risk’ students and/or a measuring tool to gauge student engagement contributes to improve student academic success.

The research in this thesis investigates the students’ and teachers’ perceptions on the use of a learning analytics tool to identify disengaged students/at-risk students and/or suggest intervention/s using student early alert systems. Effective student early alert systems are proactive rather than reactive; institutions which initiate

active individual contact with students retain more students than institutions that do not (Simpson 2005). Through the analysis of large data sets that draw together data from student information system (SIS) and LMSs, student early alert systems can inform department/teaching staff and students when students are at risk and/or suggest opportunities (intervention) for improving their performance within a unit<sup>1</sup>. The significance of student early alert systems is that support could be offered to high-risk students while they are still enrolled in the unit and able to influence their success/failure before the unit completes. However, timely intervention requires timely identification and action on the part of the teacher first and then the student. The prototype student early alert system (section 1.2) that we trialled in our study aimed to provide timely intervention.

The ultimate success and value of any information system relies on its adoption and ongoing use. From a student perspective, adoption and use would mean viewing the alerts as a positive part of their learning, even when the alert is drawing attention to their poor performance and seeks the student to change their behaviour. Given that people in general do not like bad news, criticism or being told to change, it is important not to assume students are willing and even wanting to receive alerts about their academic performance, and even less appropriate to assume they will act upon the alert (Isa & Azero 2013; Spiller 2009). Thus, this study seeks to determine students' willingness to receive early alert interventions and their perceptions of the value of receiving them.

However, to only consider what students want would be insufficient. For many years, higher education researchers and administrators have understood that teachers are the 'primary' people engaging with students and are the proxy in identifying students who may be at-risk and/or who may benefit from early intervention (Abdous, Wu & Yen 2012; Dietz-Uhler & Hurn 2013; Falakmasir & Habibi 2010). Delivering timely interventions to students via a student early alert system typically requires teaching staff to identify at-risk students, and act upon that information in a way that would encourage students to change their behaviours. While teachers already use an LMS for delivering teaching resources, managing

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<sup>1</sup> In this thesis, we used the term 'unit' to refer to the individual, low-level courses/subjects/modules that typically run for one semester. In the context of our institution, a unit is a single semester subject or course worth a fixed number of credit points.

assessments and communicating with students, it is unclear how willing and able they are to use the data associated with each student in the LMS to initiate further interactions with students. Given this, and the growing focus on learning analytics, we need to gain a deeper understanding of the perspective of teachers on student early alert systems. Knowing the teachers' perspective is important because if teachers' are not favourable to the concept of an early alert system and if the barriers are too high, then they would not use such a system, even if students want them to, and benefits are perceived.

Therefore, the aim of this thesis is to develop a greater understanding of students' and teachers' perceptions of the early alert process and the use of a student early alert system to aid the process. Understanding these perceptions may identify any gaps, issues or barriers that inhibit student early alert systems from achieving their intended potential. Identification is an essential first step in allowing these matters to be addressed by individuals, departments and institutions.

## **1.2 Institutional Perspective - Context**

Macquarie University is a large metropolitan public university on the east coast of Australia. It has been serving both local and international students for more than 50 years, annually enrolling more than 40,000 students and 3,000 staff. Providing support for student academic success is imperative in relation to recent Macquarie University policy updates. Looking at the number of units, which are supported by Macquarie University's online LMS known as iLearn, blended learning has been widely adopted at the University (Learning for the Future-Strategic Framework 2015-2024 available at [https://www.mq.edu.au/\\_\\_data/assets/pdf\\_file/0010/45838/185603.pdf](https://www.mq.edu.au/__data/assets/pdf_file/0010/45838/185603.pdf)).

Like most institutions, Macquarie faces scrutiny to develop and implement effective retention strategies and to practice data-driven decision making. At various levels of the organisation, including university-wide, faculty and department level, many groups, strategies and processes exist. However, an integrated or closed-loop<sup>2</sup> approach does not exist. The process of identifying at-risk students and offering support has existed at the institution in different forms. With a diverse student

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<sup>2</sup> From an information system perspective, a closed-loop approach refers to an information system, process, operation, method or technique is regulated by feedback

population, increasing enrolments and large classes, using student data in existing systems to provide early alerts is a logical choice to provide support to students.

Many universities provide centrally maintained LMSs and invite their teaching staff to blend online and face-to-face teaching methods, in order to meet expectations of their students (Brown, Kregar & Williams 2013; Wong & Fong 2014). For instance, the higher education administration in Learning and Teaching at Macquarie University, utilise the Macquarie University's strong tradition of innovation and exploration to work together to enhance learning and teaching, graduate outcomes and the development of blended learning cultures facilitated through the Macquarie University's Learning and Technologies platform. Following the description at the Macquarie University policies and procedures for learning technologies<sup>3</sup>, "the university maintains a university-wide learning technologies platform (iLearn) which includes: (1) the University's Moodle-based Learning Management System; (2) applications that support specific learning and teaching processes; and (3) applications that support administration and content management (such as iTeach and iShare)".

A vital part of this research is its focus on the value of early alerts to students using a prototype student early alert system. It is noted that these systems help institutions work proactively to increase student engagement and retention. To ground our investigations in the context of an actual student early alert system, rather than asking students and teachers to provide hypothetical perspectives, we used and extended an early alert system that could be implemented with the Moodle-based LMS in place at our institution. Moodle, an open-source LMS used in 225 countries with 1442 installations in Australia (Moodle 2014), has a small collection of learning analytics plugins made by its developer community that leverage the capability of an institution's existing LMS to support learning analytics (Sclater 2014). The prototype described in this thesis was an open source Moodle Engagement Analytics Plugin (MEAP) ([https://moodle.org/plugins/view/report\\_engagement](https://moodle.org/plugins/view/report_engagement)) in its infancy. During the course of this project, MEAP was significantly extended and returned to the developer so that it can be utilised by the wider education community as an early

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<sup>3</sup> <https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/learning-technologies>

alert tool for flagging students that are becoming disengaged. MEAP is presented in detail in chapter 5 (section 5.3).

I started my PhD in 2013 with the research objectives stated in section 1.5. At the end of 2014, together with my principal supervisor (Prof. Deborah Richards) and Senior Learning Designer (Mr Chris Froissard), we applied for a Teaching Delivery grant project at our institution. The aims of the Teaching Delivery grant were to pilot a student early alert system (MEAP) and validate its effectiveness. The intention was to contribute towards a business case for the use of learning analytics at our institution to improve retention and the student learning experience in blended courses. The grant proposal (29K) was successful and in 2015 we trialled and tested MEAP across a range of disciplines together with identification and alignment of student and teacher needs and attitudes.

The outcomes from the teaching development grant helped to draw together an agenda for the development of learning analytics at Macquarie University, with the aim of increasing student engagement and educational results, improving retention, addressing curriculum standards, measuring teaching quality, and through increased completion rates of Macquarie students, deliver increased revenue to the University. In addition, research on such innovative systems (such as student early alert systems) are in alignment with the strategic objectives and priorities of Macquarie University (Learning for the Future-Strategic Framework 2015-2024 available at [https://www.mq.edu.au/\\_\\_data/assets/pdf\\_file/0010/45838/185603.pdf](https://www.mq.edu.au/__data/assets/pdf_file/0010/45838/185603.pdf)).

Some of the data reported in this thesis were captured in the context of running the evaluation of the MEAP prototype. From the perspective of this thesis, the grant to extend and validate MEAP provided a grounded context in which to capture empirical data about student and teacher preferences and experiences with early alerts. It was envisaged that the lessons learned from the data as well as the enhanced and validated MEAP tool could be adapted or adopted by other institutions to achieve similar goals.

## 1.3 Motivation for this Research

The motivation of this research was to develop a conceptual student engagement and success framework where identification of students who are at risk of failure is automated and reaching out to these students is easy. Retention, and more broadly student academic success, are critical but challenging issues within the higher education sector in Australia (Johnson, Becker & Hall 2015; West, Heath & Huijser 2015; West et al. 2016). With the current push to open up university education to more under-represented students (such as low socioeconomic students), early prediction of students at academic risk of attrition is an objective of many academic institutions (Marginson 2013). According to the National Centre for Education Statistics the graduation rates of students with a bachelor's degree in the US in 2016 was 60%. According to the European Commission report<sup>4</sup> the degree completion in countries across the European Union, such as Denmark, Norway, The Netherlands, UK, France and Germany vary between 59%-82%. Australia is ahead of US and Europe as the estimates of university bachelor degree completion vary between 64.1% and 87.7% (Department of Education and Training 2017). It is challenging to obtain accurate figures as students often change degrees, institutions, their enrolment mode (from full-time to part-time and vice versa) or suspend their enrolment to resume study at a later stage, or withdraw altogether (Cochran et al. 2014; Marks 2007; Seidman 2016). According to Gilling (2010), in some universities only half of all first year students end up graduating. This has an emotional cost for those leaving their studies, but also comes with a financial cost for individuals, educational institutions and governments (Lobo & Matas 2011). In Australia, improving student retention and academic success has become a priority for universities as the Commonwealth Government included retention along with progression rates and student experience data on its list of indicators for funding of higher education institutions (Department of Education Employment and Workplace Relations 2009).

Linked to technology enabled learning and broader digitalisation of students' activities and/or student-teacher interactions are a range of opportunities to collect and analyse student data with the intention of improving the student experience

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<sup>4</sup> [http://ec.europa.eu/dgs/education\\_culture/repository/education/library/study/2015/dropout-completion-he\\_en.pdf](http://ec.europa.eu/dgs/education_culture/repository/education/library/study/2015/dropout-completion-he_en.pdf)

(Gasevis, Dawson & Siemens 2015). Learning analytics can help to understand what is currently happening with the learner/student (Dietz-Uhler & Hurn 2013). Having detailed information about students can help teachers to make personalised suggestions (Siemens & Long 2011). For example, in general if an outstanding student unexpectedly performs unsatisfactorily on an assignment, the teacher can intervene, analyse and provide feedback on why the student performed poorly. To higher education institutions, a better understanding of student academic data can help to deal with attrition rates by identifying students earlier in the semester who need help with their studies (Sclater, Peasgood & Mullan 2016).

Moreover, learning analytics has several benefits to teachers. Some of the benefits are to provide information on the quality of the educational content (Sclater, Peasgood & Mullan 2016), unit related activities, and teaching and assessment processes. Some analytics are used by teachers to monitor the performance of their students while the unit is taking place. Teachers can then transform their teaching methods provided they identify that students are struggling with a particular topic (Maseleno et al. 2018). There are currently a variety of institution specific systems (developed in-house) and/or developed using commercial software that provide a black box solution to the institution to meet their learning analytics needs (Atif et al. 2013; Siemens, Dawson & Lynch 2013). For example, the University of South Australia has staff-facing dashboards to better understand, identify and evaluate student learning, engagement, and academic performance (T. Rogers, pers. comm.), while Western Sydney University leverages a commercial business intelligence tool to predict students at-risk based on indicator variables (Barwick 2014). Analysis, identification, and referral systems exist at Edith Cowan University (Jackson & Read 2012) and the University of New England (Leece & Hale 2009). Systems that combine analysis and identification with direct student intervention have been developed at Central Queensland University (Beer, Tickner & Jones 2014; Jones & Clark 2014), the University of Sydney (Liu, Bridgeman & Taylor 2014) and the University of New South Wales (Siemens, Dawson & Lynch 2013). However, there are concerns regarding such systems from department and faculty administrators about the lack of effective practices or consistent use of them by teachers, who are responsible for conducting the intervention (Fritz 2011).

There has also been some consideration of the fundamental needs of teaching staff to improve educational outcomes (Corrin & Barba 2014; Corrin, Kennedy & Mulder 2013). Corrin, Kennedy & Mulder (2013) reported on findings from a focus group study featuring 29 staff associated with learning and teaching at one Australian institution (The University of Melbourne). A variety of educational problems, situations and potential ideas were raised by the participants in their study. These fell into five categories: student performance; student engagement; the learning experience; quality of teaching and the curriculum; and administrative functions associated with teaching. The expertise of teaching staff providing proactive interventions is important to ensure that interventions are appropriate and genuinely helpful to the student.

There are concerns around possible objections by students regarding the ethical, privacy issues and willingness to the use of their LMS or other academic data for learning analytics, these issues are not widely reported in the literature (Slade & Prinsloo 2013; Willis, Campbell & Pistilli 2013). However, at the time that this PhD commenced a comprehensive study of the students' and teachers' viewpoints in the context of attitudes and opinions towards early alerts and actual use of an early alert system to improve student engagement had not been undertaken.

Cognisant of these challenges and the promise of learning analytics, this thesis focuses on the use of early alert systems to provide timely support to students. The research draws on the success and retention literature as the theoretical basis to design an instrument for data capture. Empirical data on the perceptions and experiences of students and teachers towards early alerts systems was collected using a case study and an actual early alert system explored in a real world context, that is, with students and teachers as they undertake units of study in an actual institution.

We decided to include both the students' and teachers' perspectives in this study. The idea behind student early alert systems is that student data could be used to identify trends among students, enabling teaching staff (particularly those responsible for managing and monitoring student performance) to intervene with students in need of support. Notably, students who are identified as likely to be at risk of failing the unit and perhaps eventually discontinuing or leaving the education system. Focusing only on the students or the teachers would cause an imbalance

since learning analytics is useful to both students and teachers. Useful to students to know their progress in the unit, relative success and opportunities to interact with peers or teachers. Useful to teachers to know which students are participating, how successful they are in the unit and to provide timely interventions. If we understand that the goal of a student early alert system is to refine, organise and redirect data already captured in university systems to teaching staff with the aim of identifying and contacting students who would be likely to either drop-out or fail (Bruce et al. 2011; Macfadyen & Dawson 2010), we must ensure that both students' and teachers' perspectives are understood and integrated into the design and implementation of any early alert processes and tools.

The theoretical framework and the theories discussed in the next section serve as a groundwork or foundation to the proposed student engagement and academic success conceptual framework. Moreover, the theoretical framework will highlight the influences of these concepts of persistence, retention, engagement/involvement and academic achievement/success with the cognitive aspects, social aspects, initial commitments that the student brings to institutions and the role of the learning environment in the student experience (Atif, Richards & Bilgin 2013; Swail 2004).

## **1.4 The Theoretical Framework as a Conceptual Lens**

Student success and retention at a unit level is a complex, dynamic and multi-dimensional phenomenon. This phenomenon is influenced by the interaction of personal (initial student aspirations and motivational variables), academic and environmental factors (Nelson 2014). Since the 1970s, a number of student retention/attrition models were developed to explain why students fail to persist as opposed to why they succeed, such as Tinto's (1975) theory of student departure, Bean's theory of student retention (1980) and Astin's theory of student involvement/engagement (1993). The extensive review of the literature showed that these models do not consider student engagement and academic success at the unit level. Furthermore, these models were not developed to empower students in their learning experience or help teachers to understand when students in their classes could be at academic risk. Therefore, these models are not necessarily actively contributing to retaining students at the unit-level. Dramatic changes have occurred in the higher education sector since the conception of Tinto's model. For example,

change in HEIs include the use of LMS, the rise of blended learning, online learning and massive open online courses (MOOCs) (Rodriguez 2012; Yuan & Powell 2013), increased competitiveness, globalisation, wider participation and integration with industry. These changes have provided greater access to education, ubiquitous content, use of digital technologies and social media for students' learning. Given the increased complexity of student-institution interaction, we propose an eclectic<sup>5</sup> model that draws these earlier theories together to envisage the possible impacts of learning analytics on student learning. Table 2.2 summarises the key concepts of our eclectic model.

Building on Tinto's theory of student departure (1975), we added a number of components from Bean's theory of student retention (1980), Astin's theory of student involvement/engagement (1993) and Swail's geometric model of student persistence and achievement (2004) to proactively monitor students' engagement in learning and make timely interventions to meet the needs of each individual student, raise their confidence as learners to activate their participation in their learning and promote help seeking behaviours. These models are the most widely recognised models in the domain and claim that student retention is affected by the interaction between the students and the institution. Each of these models has a significant illustrative and explanatory power. We believe that a theoretical framework which presents an integration of components from these models may present a considerable improvement over a model taken alone. All these models offer an essential understanding into the theoretical basis for exploring the factors that describe and help to understand and predict a student's decision to persist or leave. The components of these models are selected as theoretical concepts that describe the characteristics of students that will be used to identify students at-risk and deliver (personalised) interventions.

Through the conceptual lens provided by the proposed theoretical framework, it is apparent that student engagement at multiple levels is critical for their success. An early alert system is about detection of (dis)engagement. Following this line of argument, it would appear that provision of early alerts is an important strategy for

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<sup>5</sup> Our proposed eclectic model uses a set of variables involved in the learning process (from a group of models/theories) and allows the stakeholders and users (researchers, administrators, counsellors or others) to find out how these variables act on specific populations and institutional settings.

student success. Drawing on the concepts in this theoretical framework, we developed a theory-based student survey (chapter 4) to investigate students' class and unit level engagement and their attitude towards an early alert system. The survey includes questions related to cognitive engagement and learning motivation within the unit; emotional engagement to the teachers, peers and unit content; behavioural engagement regarding their attitudes to early alert and intervention such as whether students are willing to be contacted, what their preferences are concerning contact, whether they will change their behaviour, whether they will give access to their data; whether teachers are willing to use such systems and what are the barriers they face. The institutions learn how to act on these theoretical structures through the collection of data to further understand the attitudes, behaviours and cognition of students at the unit-level.

Finally, this thesis seeks to determine whether there is a match or mismatch between the theory (Tinto's theory of student departure, Bean's theory of student retention and Astin's theory of student involvement/engagement) and the empirical data concerning the student-teacher perspective of the need, desire for and value of early alerts.

A more detailed description of our theoretical framework is provided in chapter 2.

## **1.5 Research Objectives and Questions**

Following on from the above theoretical framework, the aims of this exploratory research are two-fold:

1.5.1 To study the perspectives of students and teachers regarding early alerts and the potential benefits and barriers to the early alert system usage within the context of an actual prototype early alert system.

1.5.2 To develop a conceptual Student Engagement and Academic Success (SEAS) framework based on the theoretical framework and validate it based on the empirical data.

To achieve the above objectives, the central research questions related to the first aim (1.5.1) are:

From Students' Perspective:

- What are the opinions and preferences of students with respect to early alerts?
- What is the attitude of students receiving an early alert/intervention?
- Do students report change in behaviour for how they studied for a unit, if they actually receive an early alert?
- Do early alerts increase student performance and motivation to continue in the unit?
- Do early alert notifications increase student motivation to utilise the campus student support services?

From Teachers' Perspective:

- What are the perceptions of teachers with respect to early alerts?
- What information would the teaching staff find meaningful to include in a student early alert system?
- What are the potential barriers to early alert system usage?
- What are the experiences and motivations of teachers with regard to usage, helpfulness and barriers/challenges to the use of a prototype early alert system?

The essential question related to the second aim (1.5.2) is:

- What are the key concepts and their relationship that comprise a conceptual Student Engagement and Academic Success (SEAS) framework including the student and teacher perspective?

## **1.6 Overview of the Chosen Research Methodology**

The research methodology outlines the overall approach and strategy of activities undertaken in this research. In order to answer the research questions (section 1.5), this thesis followed the mixed methods (Venkatesh, Brown & Bala 2013) approach. The research was undertaken in the form of two suites of studies: 'student perspective' study and 'teacher perspective' study. Data was collected over a period of 18 months through semester-specific student and teacher sub-studies. Analysis

was first performed separately on the sub-study data for each perspective. Then, results from both perspectives were compared and interpreted. The research tools/techniques used to gather the opinions and preferences of students was an online, mainly quantitative survey questionnaire. The perspectives of teaching staff were explored by a sequential exploratory design (qualitative face-to-face interviews followed by a quantitative survey interview). For both studies, participants were recruited from undergraduate units (the number of students in the units ranged between 59-1455 students) representing four faculties (arts, human sciences, business and economics, and science and engineering) delivered in either an online or blended mode at our institution. These units were selected because they consisted of a range of online activities (forum discussions, quizzes and assignments) that students needed to complete in the LMS and they had a relatively high number of at-risk students (at least 10% non-completion and fail rate in the last study period). An additional study (as case study 5) was conducted to capture qualitative student perspective data and review institutional uptake of the MEAP system to provide a holistic and current picture at our institution.

These methodological considerations will be explored in greater depth in chapter 3.

## **1.7 Research Intended Contributions**

It is expected that this thesis can contribute to the extant literature and knowledge in several ways, resulting in the following contributions:

### **1.7.1 Theoretical Framework**

The theoretical framework (section 1.4) is based on prior student engagement and retention models. It was developed to extend our understanding of student retention behaviours and the factors identified as determinants of student engagement, retention and academic success (Chapter 2, section 2.2.3). The strength in the theoretical framework lies in its ability to help HEIs to work proactively to support student retention and achievement. A theory-based student survey was conceptualised and designed. This was important because empirical evidence was needed for a better understanding of the students' perception of the early alert process. Furthermore, the framework provides guidelines for application of early alert systems, while considering data privacy issues. The details of the survey instrument are provided in chapter 4.

## **1.7.2 Understanding Student Perspective**

This thesis aims to gather the opinions of students across our institution covering all faculties (Chapter 4). It is important to know the students' preferences regarding early alerts and their attitude to being contacted (such as whether the early alert system has increased student's academic performance and/or motivation to continue in the unit after receiving an alert). Understanding student perspectives regarding early alerts is an important strategy to improve and increase student engagement and their academic success at a unit-level.

## **1.7.3 Understanding Teacher Perspective - Barriers to Usage**

This thesis aims to capture the opinions of a wide range of teaching staff about how they do/would measure student performance; determine if students are engaged in their units; and the perceived benefits and barriers of a prototype early alert system (MEAP) (Chapter 5).

## **1.7.4 SEAS Conceptual Framework**

The abbreviation SEAS stands for student engagement (SE) and academic success (AS). A foundational SEAS conceptual framework was proposed to ensure student engagement and academic success at the unit-level (Chapter 6). This conceptual framework could be used as a diagnostic tool to contribute towards increasing understanding of the complex factors that affect student engagement and success within a unit.

## **1.7.5 Other Contributions**

### **1.7.5.1 Recommendations to Institutions**

By understanding the student and teacher perspective, it was anticipated that certain barriers and issues would be identified. As changing policy and processes at any organisation is difficult and cannot be a guaranteed outcome for a PhD thesis, this thesis sought to offer a set of recommendations for consideration and possible implementation by institutions (Chapter 8, section 8.6).

### **1.7.5.2 Validated Prototype Student Early Alert System (MEAP)**

Two forms of validation have been undertaken. Firstly, the outputs of the prototype early alert system (MEAP) were validated. MEAP allows the teacher to select from

four different indicators. These indicators are: assessment activity (e.g. how late an assessment is?); forum activity; login activity (e.g. how long a student is online in iLearn?); and gradebook. Within these indicators teachers set the thresholds (or benchmark weighting) to calculate a risk score for students in their unit. The MEAP has been evaluated by comparing the calculated risk score (within MEAP) with historical student data (Liu et al. 2015b). Secondly, use of MEAP was validated through its use across our institution involving 15,142 students and 46 teachers across all faculties. The success of MEAP at an institutional level is evidenced in MEAP having become an institutional tool supported by our Learning and Teaching centre (Chapter 7). In the 2017, MEAP was successful in being awarded twice. (1) Macquarie University-Faculty of Arts Learning and Teaching Award titled “For service innovation in the design, development and implementation of a learning analytics tool that supports learning and teaching”. (2) Macquarie University Vice-Chancellor’s Citation for Outstanding Contributions to Student Learning titled “For developing and leading an innovative learning analytics solution that has influenced and enhanced learning and teaching and the student experience.”

## **1.8 Research Scope and Delimitations**

This section seeks to clarify the scope of the goals and study conducted. This thesis novelly explores student and teacher attitudes, in contrast to the focus of many other studies in learning analytics. The following sub-sections clarify what was not within the scope of this project and also delimits the context in which the study was conducted.

### **1.8.1 Not About Algorithms or Tool Usability or Acceptance**

The focus in this thesis is on the views and responses of users to the use of early alerts, not on the underlying algorithms that detect poor performance or predict student success or risk. Furthermore, it was not our aim to conduct a usability or technology acceptance study of a particular student early alert system. The MEAP prototype has been employed so that students and teachers have experience with a concrete tool therefore the opinions they express are more than hypothetical. In that way, some of our findings may be specific to or a response to the MEAP prototype. The only way to avoid such a limitation would be to provide students and teachers with access to multiple student early alert systems, but this is not feasible

particularly given that real student data was used by the prototype during the course of the running of actual units.

### **1.8.2 Restricted to Learning Analytics**

One approach to understanding learning analytics is to recognise what is ‘not’ learning analytics. Earlier in this chapter (section 1.1), we distinguish learning analytics from its adjacent fields such as educational data mining (EDM) and academic analytics. Building on that, it is important to note here that this PhD research is using learning analytics at unit-level where it centres the learning process of students discovering the relationship between student, teacher and the unit content. The notion of ‘teacher analytics’ can also be associated with learning analytics. The concept is further investigated by Xu and Recker (2012), Yishay et al. (2015) and Sergis and Sampson (2017). They used EDM (clustering) to explore teachers’ online behaviours in the context of using online repositories, educational digital libraries and online [web] resources. Therefore, EDM, academic analytics and teacher analytics are outside the scope of this thesis.

### **1.8.3 Restricted to Unit-Level Data**

With learning analytics, when a ‘data-centric’ or ‘analytic’ perspective is taken, it is common to think in terms of vast amounts of data stored in SIS and LMS (Daniel 2015) and in various databases such as admissions files (Picciano 2012), library records (Tair & El-Halees 2012), social media tools (Siemens & Long 2011) and cloud-based storage (Mackay 2013). This data is the digital footprint that students leave behind when they interact with networked learning environments (Chatti et al. 2012). For example, when students interact with learning technologies (LMS or similar systems), they leave behind data trails which can report their opinions, intentions, goals and social connections. These data trails can be used to study student behaviour and academic performance at certain time stamps during the semester to explain the barriers and challenges to student (dis)engagement and value of any interventions done. Furthermore, learning analytics deals with educational data at multiple levels such as macro-level (region/state/national/international), meso-level (institution-wide) and micro-level (individual user or cohort behaviour level) (Shum, Knight & Littleton 2012). It is

important to note here that this thesis is only looking at the micro-level (unit-level data in a LMS) learning analytics.

There are a number of other restrictions on the scope and type of data being analysed to send early alerts. It was not possible to include triggers in our student early alert system relating to in-class behavioural problems and social factors. Further, our current system did not have access to disruption/special consideration requests or student demographic data, data that are potentially relevant for determining risk levels and appropriate interventions.

A potential criticism of the use of LMS data is that such data cannot measure student learning and engagement, it only allows researchers to assess historical trends (relationship between LMS use and grade performance) that may provide proxies for actual learning (Alhajraf & Alasfour 2014; Caruso 2006; Kuh et al. 2011). A further limitation is that the LMS data does not capture other indicators such as family income or hours of employment (such data is unlikely to be captured in any higher education institute system), regardless of research showing strong correlations between these variables and on-time graduation (Frazelle & Nagel 2015). Nevertheless, the narrowing of scope to the unit-level has been intentional. As students succeed or fail in their studies unit by unit, assessment by assessment, we chose to analyse the data and deliver ‘early alert’ interventions at this level.

#### **1.8.4 Restricted to One Institution**

While our study was conducted across an entire institution with representation from four faculties, the perspectives collected are limited to one institution. The main reason for this delimitation is that our study was situated in the context of a live, albeit prototype, student early alert system that was deployed with live student data and involved actual student interventions. As such a tool was not already available for use with our LMS data, we first needed to extend an existing plugin for Moodle and integrate our system with our student data. Even though much of the data collection involved capturing viewpoints, it was also essential to access student data in order to identify at-risk students and send early alerts. It is difficult to gain ethics approval to access student data at our own institution. Gaining access to student LMS data at another institution would be possible if we collaborated with researchers from other institutions however, we were not allowed to share our data

with other teachers at other institutions; therefore, the data collection was limited within our institution. As we have released the code to the open source community, pending new ethics approvals for further data collection of teacher perspectives at other institutions may become possible in the future.

## **1.9 Thesis Outline**

In detail, the thesis at hand is organised into seven chapters. The following sentences provide brief descriptions of each chapter.

Chapter 1 provides an introduction to the study and appropriate background information. Chapter 2 gives an overview of literature on student retention, engagement and related work regarding student early alert systems. Chapter 3 describes the methodology of the study. Chapter 4 presents the student perspective and complete analysis of the data collected. Chapter 5 presents the teacher perspective and complete analysis of the data collected. Chapter 6 draws together the findings of chapters 4 and 5, answers the research questions and presents the resultant conceptual SEAS framework. Chapter 7 presents the ratification of the prototype system (MEAP) at our institution and an additional case study conducted post implementation of university wide rollout of MEAP. Chapter 8 summarises the main contributions and outlines possible extensions as well as future challenges (conclusions, limitations and implications).

## **2 CHAPTER: LITERATURE REVIEW**

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### **2.1 Introduction**

The topic of student engagement, success and retention is not new to research in the higher education domain. Students' opinions and attitudes about timely intervention using early alert systems, their motivation to perform better and finding ways to encourage students to seek institution specific resources are all important to student academic success. However, students' and teachers' points of view about student early alert systems to retain students at a unit level has not been investigated. We believe that this PhD thesis is a first step to understand the current approaches used for student engagement in an online unit using technology innovations such as MEAP (the prototype system in this study).

This chapter presents an exploration of related literature on student engagement, retention and early alert systems. Section 2.2 briefly overviews student engagement, retention and academic success. It includes the various theories and factors that lead to student withdrawal and provide a theoretical framework in this study. Section 2.3 presents the analytics in higher education with a focus on learning analytics processes, models, benefits and challenges. Section 2.4 details the impact of early interventions in higher education and specific literature related to international, Australian and other case studies by commercial providers. Finally, section 2.5 summarises the chapter to identify the gap in the field that this research addresses.

### **2.2 Student Engagement, Retention and Academic Success in Higher Education**

There is vast amount of literature about student engagement and its importance to higher education institutions. Student engagement has multiple dimensions and there is no single definition of student engagement in the literature that fits all scenarios i.e. in-class and/or outside the class. Typically, engagement is linked to student motivation, undergraduate academic success and student retention (Beer, Clark & Jones 2010).

The following sections seek a broad definition for engagement, retention and academic success that is in frame of reference for a large metropolitan tertiary institution similar to Macquarie University.

### **2.2.1 Student Engagement**

The notion of student engagement has its roots in late 20<sup>th</sup> century research. Since then, many researchers have defined student engagement in various contexts i.e. from the perspective of both engaged students and disengaged students. A lot of researchers' study engagement within the context of 'life in educational institutions' such as what happens in classrooms (classroom engagement) and inside the institutional environment (campus engagement). Researchers typically focus on students' *academic engagement* (Skinner & Pitzer 2012).

Student engagement is conceptualised as a multi-dimensional concept such as affective (emotional) engagement, cognitive engagement, and behavioural (social) engagement (Fredricks, Blumenfeld & Paris 2004; Kahu 2013). *Affective/emotional engagement* describe students' emotional connection and sense of belonging to their educational institution and its community (e.g. teachers, peers, groups, and societies). The different studies (Ainley 2012; Gunuc 2014; Pekrun & Linnenbrink-Garcia 2012; Van Ryzin, Gravely & Roseth 2009; Voelkl 2012) carried out for this form of engagement assess: students' affective reactions in the classroom (e.g. interests, enjoyment, happiness, boredom and anxiety during academic activity); affective reactions to the teacher (e.g. liking, respectful relationships); and being part of their institution (e.g. identification, belonging, valuing). *Cognitive engagement* includes, "investment in learning, value given to learning, learning goals, self-regulation or being strategic" (Fredricks, Blumenfeld & Paris 2004, p. 63). Cognitive engagement has a significant association with learning motivation. Cognitive engagement talk about category of students who put effort in their own learning and as a result identify their learning requirements and enjoy participating in challenging academic activities (Fredricks & McColskey 2012; Gunuc 2014). *Behavioural engagement* includes students' participation and contribution towards their own learning (including academic or non-academic activities such as social and extra-curricular activities), their efforts (time spend on assessment activities), their attendance in classes and positive conduct (following classroom rules, absence of disrupting behaviours) towards the learning (Gunuc 2014).

Keeping in mind the above dimensions of student engagement, the definition by Astin is considered as a good basis for understanding as it covers both engagement [as involvement] inside and outside the class boundaries. Astin (1985, p. 297) describes student engagement by way of, “the amount of physical and psychological energy that the student devotes to the academic experience”. Astin highlighted that an engaged student is the one who spends more time with other students, regularly interacts with faculty, and actively participate in extracurricular activities. Since then, the literature on student engagement became a mixed bag as different authors have discussed engagement considering diverse factors. The factors discussed in the literature are student’s interest and effort toward learning to achieve the desired outcomes (e.g. high grades), time-on-task, sense of belonging, class participation, and attendance (Krause & Coates 2008; Kuh et al. 2008; Robinson & Hullinger 2008; Willms 2003).

After a review of the literature on student engagement, we concluded that there is no single definition for engagement. Given this fact and in line with our research aims, we chose the following definition of student engagement typically used in Australian literature by Coates (2010a) as it represents an aggregation of the collected works and contribute to the Australian Survey of Student Engagement (AUSSE). According to Coates (2010a), student engagement is related to focused student-teacher contact, active and collaborative learning, class participation, feeling legitimated (responsible) and supported by university community (groups or societies). This definition of Coates suggests that engagement is the union of different constructs containing active learning<sup>6</sup>, collaborative learning<sup>7</sup>, participation, student-teacher correspondence, and students feeling recognised, encouraged and supported. We noted from this definition of Coates that student engagement is mainly dependent on a range of interactions. Therefore, we choose to study the impact of student interactions required for learning on student engagement in an online/blended learning environment.

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<sup>6</sup> Active learning is defined online (<https://www.everettcc.edu/files/administration/institutional-effectiveness/institutional-research/outcomeassess-active-learning.pdf>) as, “any instructional method that engages student in the learning process and requires students to perform meaningful learning activities and think about what they are doing”.

<sup>7</sup> Collaborative learning is defined by Online Collaborative Learning in Higher Education (<http://clp.cqu.edu.au/glossary.htm>) as, “any instructional method in which students work together in small groups toward a common goal”.

### 2.2.2 Student Retention

For nearly four decades, researchers in higher education have been studying the phenomena of undergraduate student engagement, retention, and academic success and the literature on retention internationally is voluminous. Higher education institutions usually measure student success as program retention, unit/course retention, student retention rates (also called continuation rates) and graduation rates (also called completion rates) (Seidman 2005). Student retention rates and graduation rates are commonly regarded as primary indicators of institutional performance (Campbell 2007; Lobo 2012). This is because student enrolments and/or students persisting to completion of their educational goals can be translated into money (returns in dollars) for educational institutions.

Researchers have reported definitional issues associated with the term retention. We noted sixteen overlapping terms associated with retention. For instance: success, progression, persistence, goal attainment, completion, achievement, transfer, attrition, deferral, withdrawal, drop-out, early departure, failure, wastage, discontinuation and stop-out. An initial step towards a more informed theorising of the student retention phenomenon is to define the term *retention*. The opposite of student retention is *attrition*, often used interchangeably with retention. For the purposes of this study, the definitions of retention and attrition to be used are most similar to those suggested by the Department of Education, Employment, and Workplace Relations (DEEWR) (Olsen, Spain & Wright 2008). DEEWR defines student retention and attrition as, “the students enrolled in one year of a course or degree who are enrolled in the subsequent year” and “the measure of the proportion of students in a particular year who neither graduate nor continue studying in an official university course at the same institution the following year” (Olsen, Spain & Wright 2008, p. 2). By identifying and distinguishing these terms has allowed us to be critical in terms of understanding the context of student retention and to define a set of categories of student retention or attrition behaviours as shown in Table 2.1. Each of these groups of students has a unique set of characteristics and experiences. Within this thesis, the above mentioned overlapping terms are used as the authors of the cited articles have used them. In order to include a broad review of the literature as possible, we prefer to use the term retention because it deals more specifically with the enrolment and successful completion of studies by a student.

**Table 2.1: Student Retention Behaviours**

<b>Types of Student</b>	<b>Description of Behaviour</b>
The persister	A student who is uninterruptedly enrolled at an institution. S/he is also known as the stayer or retained student.
The stop-out	A student who left the institution for some time and later comes back to the same institution for other study.
The transfer-out	A student who begins studies at one institution and then transfers to another.
The attainer	A student who withdrew prior to graduation but after accomplishing a specific goal. S/he is also known as opt-out.
The drop-out	A student who left the institution for ever. S/he is also known as a leaver.
The slow-down	A student who goes from full-time attendance to taking just a few courses. S/he is also known as a part-time student.

It is important to note the highlighted rows: ‘the transfer-out’ and ‘the slow-down’. There is an ongoing debate in the higher education sector about ‘the transfers’.

Many students who leave university are not ‘lost to the system’. They may re-enrol at another university either immediately or in later years or they may come back to the same university to enrol in a different course (Department of Education Employment and Workplace Relations 2009).

From the students’ perspective, transferring is a normal and not necessarily a negative activity. On the other hand, from the perspective of the institution where the student was first enrolled, the student has dropped out. However, to calculate student retention at a university is a complex process. A publication providing an Australian perspective by Maher and Macallister (2013) identify the following factors vital to student retention: pedagogy, class structure, nature of assignments, institutional factors, personal factors, activities that help students’ feeling part of the supportive learning community (outside the classroom), and students’ informal interactions with peers and academic staff. Both researchers are of the view point that, “students involved in such interactions feel valued and having a bond already established with lecturers, they are more likely to seek support which eventually enhances the likelihood of their academic success” (Maher & Macallister 2013, p. 63).

Moreover, retaining a student is very important for an institution to carry out its mission and key objectives. It is also important to reflect on attrition because one of the complications faced by the higher education sector today is that many

students leave before graduating. Therefore, the question researchers, employers, institutions, students and families of students are currently most interested in is, *why do students leave the institution before completing a degree*. According to Campbell (2007), when a student(s) drops out, it directly or indirectly affects the student themselves, the institution and society. For this PhD thesis, the focus is more on unit retention rather than at the program-level or institution-level student retention rates. Unit retention is a measure of the number of students still enrolled in a unit after the unit HECS census date<sup>8</sup>. In other words, how many students completed the unit at the end of the semester?

In order to understand the factors further related to the concepts of student engagement and retention at the unit level, the following section reviews the various theories and models.

### **2.2.3 Student Engagement/Retention Theories and Models**

The literature on student retention and attrition describes an extensive collection of theories and models that could be used (alone or in combination) to explain why students leave educational institutions. The study of student retention began with the work of Vincent Tinto (1975) on the examination of student drop-out characteristics. Since that time, the research has transformed from the study of drop-out characteristics to the development of holistic models of retention and attrition from the perspective of student-institution interaction. Again, student retention has been investigated for various student populations (e.g. first year students or senior students) and different institutional settings (e.g. students attending for two or four years). The results showed that retention is influenced by three attributes of student cohort, namely: 1) institution types (public, private, vocational education and training institutions, or higher education institutions e.g. university); 2) chosen study majors or disciplines (computer science, business, nursing, information systems); and 3) the cultural background of students. Some of the studies of student retention in higher education have specifically focused on the development or construction of predictive models to identify and explain the complex interactions of factors that contribute to students' intention to persist (Bogard 2011; Delen 2010; Yu et al. 2010). Other researchers also provide an empirical validation of theoretical

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<sup>8</sup> It is the last date to withdraw from a unit without financial or academic penalty

retention models (Bogard 2011). While studies and models for student retention vary in many ways, the basic notion remains the same, that is, retention is influenced by a number of complex factors. Therefore, the responsibility for improving retention is a shared responsibility between the institution and the student (Campbell, DeBlois & Oblinger 2007). Typically, the researchers in this domain have incorporated individual, environmental and institutional characteristics in their models as being effective predictors of student retention. We noted that all student engagement and retention theories and models tend to be longitudinal and contain different factors normally related to both student and institutional characteristics. On the contrary, our aim was to develop a theoretical framework based on these traditional theories/models and to select only those factors related to student engagement and retention at the unit-level. Four widely used theories of student retention such as by Tinto (1975), Bean (1980), Astin (1985), and Swail (1995) outlined below will provide a reference framework for this thesis. While this study does not focus specifically on retention, academic performance and success are considered important in many of the student retention models. It can easily be argued that more engaged students will have better performance than less engaged students. Therefore, this thesis aims to show accurate predictors of student engagement in a unit; develop theories to provide a potential intervention strategy to improve student retention and academic success.

#### **2.2.3.1 Vincent Tinto's Theory of Student Departure**

This is the first and perhaps the most cited theory of student retention. The conceptual model developed by Tinto in 1975 seeks to explain the student withdrawal process. In this model, students enter higher education with a diversity of personal, family, and academic characteristics and skills. Collectively, these student characteristics and skills lead to the formation of an initial commitment to the institution and to their personal educational objectives. The initial commitment influences how well the student get mixed into the social and academic environment of the institution. Over time, the student's subsequent interactions and experiences within the institutional environment influence the student's overall perceptions about their fit at college/university. Positive interactions within the environment presumably lead to greater student integration. As integration increases, the student's commitment to their personal educational goals and participation within

the institution increases. Likewise, negative interactions impede integration into the social and academic environment and ultimately lead to disengagement from the institutional academic and social environment. As the disengagement continues, a student decides to leave an institution when he or she no longer perceives a match with the institutional environment (Pascarella & Terenzini 1983). Positive social and academic experiences increase a student's institutional and academic goal commitments, thus, leading to an increased likelihood for persistence. Within Tinto's model, academic integration was viewed in terms of grade performance and knowledge. Social integration was related to faculty and peer interactions. Tinto's research demonstrates the importance of academic success as it relates to student retention. Tinto's research also provides a solid reason to increase faculty or student faculty interactions based on the results of any student academic success and retention model.

#### **2.2.3.2 John Bean's Explanatory Theory of Student Retention**

Another influential model is Bean's model (1980) which was derived from the theory of organisational turnover and psychological theories such as attitude-behaviour theory, coping behavioural theory, self-efficacy theory and attribution theory which lead to academic and social integration. Bean categorises the various factors that influence student retention into four groups. The first group includes all the academic variables which can be measured by student grade point average (GPA). The second group contains the factors related to student's intention to leave, which can be a result of psychological factors such as quality of units is a major issue facing universities, satisfaction, goal commitment and stress. The third group of factors connects with student demographics and background such as high school performance, parental education and socio-economic status. The fourth and last group of variables are external factors which have a direct effect on a students' decision to stay or leave, for example finances, hours of employment and family responsibilities.

#### **2.2.3.3 Alexander Astin's Theory of Student Involvement**

Astin's Student Involvement Theory postulates that students learn more when they are involved. In 1993, he proposed the 'Input-Environment-Outcome (I-E-O) model' as a conceptual framework to study student retention. The fundamental elements of the I-E-O model are inputs, environment, and outcomes. *Inputs* refer to

the attributes and the personality traits of a student at the time of admission; *environment* refers to the various educational experiences and interactions with the community (teachers, peers, societies); and *outcomes* refers to the student's characteristics, knowledge, attitudes, beliefs, and values after graduation. The purpose of the model was "to assess the impact of various environmental experiences by determining whether students grow or change differently under varying environmental conditions" (Astin 1993, p. 7). Astin (1993) identified 146 possible input variables (e.g. student demographics, background, previous experiences), 192 environmental variables (e.g. institution services, students' peer group, faculty, curriculum, financial aid) and 82 outcome variables (student's characteristics, knowledge, attitudes, beliefs and values after exposure to the institutional environment). Astin's research provides a good baseline for this research study and helped us to determine and identify factors that influence student engagement or involvement within a unit.

#### **2.2.3.4 Swail Watson's Geometric Model of Student Persistence and Achievement**

Watson's conceptual framework is unique from other retention models as he places the student at the centre of his proposed model. The fundamental elements of the conceptual model are: cognitive, social, and institutional factors. *Cognitive factors* relate to the competence, knowledge, academic skills, and abilities a student carries at the time of admission. *Social factors* refer to the external factors that characterise a student such as ability to interact with other people effectively, family and peer support, personal attitudes, cultural history, career goals, and social coping skills. *Institutional factors* refer to the academic and social practices, strategies, culture and ability of an institution to provide required support to students during the study years.

#### **2.2.4 Factors Contributing to Student Engagement and Academic Success**

We learned from the review of the literature that student engagement was difficult to quantify specially when observed at a unit-level. There are many variables involved such as demographics, student expectations, academic preparation, level of interactions with the teacher and the unit content, unit environment in which the learning occurs and student attitudes to interventions.

### **2.2.4.1 Student Expectations and Perceptions of Academic Study**

The literature suggests that undergraduate students are not as well informed about university academic study, learning environment and lifestyle as university teachers and administrators believe (Byrne et al. 2012; Jones et al. 2003; Kandiko & Mawer 2013; Lowe & Cook 2003; Money et al. 2017).

A study conducted at the University of Ulster, Ireland by Lowe and Cook (2003) investigated student expectations and levels of preparation for university study. The findings show that the student expectations of teaching staff were not met in many cases. For example, 35% of the sample of 691 students believed the university did not have ‘helpful, friendly teaching staff’, while only 41% saw staff as ‘sympathetic and reassuring’ (Lowe & Cook 2003). Furthermore, it was found that a negative experience with academic staff could be harmful to students’ chances of success (Lowe & Cook 2003). In relation to the academic difficulty experienced by students, it was shown that the gap between student expectations and actual experience was particularly wide, considering the harder work they would experience at the university in contrast with the school work they had previously experienced.

In Australia, the controversial gap between students’ expectations and perceptions of academic study has also been identified as an important factor associated with disengagement, academic failure, and eventually withdrawal. The gap is between what both domestic and international students think university is like; their expectations and perceptions of quality of service the institution promises; what they expect from their program of enrolment such as time management, workload or other expectations; and/or academic preparedness in units under taken. In 2000, McInnis, James and Hartley published a report dealing with trends in the first year experience. This report was a follow-up to a study conducted in 1994 by the Centre for the Study of Higher Education at The University of Melbourne (McInnis, James & McNaught 1995). The report published in 2000 aimed to provide an analysis of the trends and perceptions of first year undergraduate students in seven Australian universities. The universities were not disclosed in this study due to confidentiality reasons, however, they were distinguished under the following titles: Established, Suburban, New, International, Regional, Applied, and Consolidated. In total, 2609 first year students participated in the study, and approximately 51% of the beginners

were aged 19 and under (McInnis, James & Hartley 2000). Overall, the study found that approximately 58% of the 2609 participating students believed that studying at university was more challenging than studying at school. Whereas 43.1% of the higher education institution leavers believed the standard of work at university was higher than they had expected.

We believe that identifying factors related to student expectations and perceptions of academic study at a higher education institution are likely to influence the students' judgement of how much more demanding university work can be as compared to school. For this reason, we have included questions related to student expectations and preparedness in our student survey (chapter 4).

#### **2.2.4.2 Academic Preparation and Performance**

A US based educational organisation's quarterly magazine published that "...the single biggest predictor of an institution's [retention and] graduation rate is the [academic] preparation level of its students" (American Association of State Colleges and Universities 2005, p. 26). A student's academic preparation is usually reported as 'readiness' in the literature, which also includes educational motivation or aspirations. According to Bandura (1993, p. 117):

"Students' beliefs in their efficacy to regulate their own learning and to master academic activities determining their aspirations, level of motivation and academic accomplishments."

Beside student self-perception of their abilities, non-cognitive factors such as students' mindset, students' aspirations, their achievement goals and sense of belonging are the other driving forces critical to their academic success (Dweck, Walton & Cohen 2014). For example, some studies demonstrate that [tertiary-level] students' educational plans and intentions to complete their degree are closely related to each other (Marjoribanks 2003; McCarron & Inkelas 2006). On the other hand, there are discussions regarding [college] students' perceptions of their academic performance and degree of learning having a weak relationship with their actual performance and learning (Lew, Alwis & Schmidt 2010).

There is a lot of discussion in the literature regarding retention/attrition and the determinants of student academic performance. A list of these determinants and factors were discussed in section 2.2.3 (retention theories). It is important to note that the whys and wherefores for the first year students would be different from 2<sup>nd</sup>

or later year students. A possible reason (beside others) could be that first year students especially First Year First Semester, are more sensitive to factors such as the availability, accessibility and helpfulness of the teaching staff. Willcoxson et al. (2011) concluded that there are more personal factors (such as lack of academic and social integration) influencing first year student attrition, while more institutional factors (such as teaching quality, student-staff interactions and support availability) influencing later year students. Astin suggested and later followed by other researchers that one usual way of evaluating student engagement and performance is through academic achievement, measured by grade point average (GPA) (An 2015; Asarta & Schmidt 2017; Asby 2015; Astin 1985; Campbell 2007; Danilowicz-Gösele et al. 2017; Lambert et al. 2012; Pascarella, Terenzini & Feldman 2005; Plant et al. 2005). Moreover, these researchers showed that a first year student whose GPA is high, is more likely to stay than a low performing student. Tinto (2012) cites two reasons why poor academic performance frequently results in withdrawal from the university environment. First, most institutions have established policies that prevent the student whose GPA is less than an established level from re-enrolling. Second, the low GPA can cause a student to leave because of the negative social stigma attached to failure (Tinto 2012). Within the Australian higher education context, few researchers have found the Australian Tertiary Academic Rank (ATAR)<sup>9</sup> as an important factor to impact student performance (Cardak & Vecchi 2013; Li & Dockery 2015).

In recent years, a new aspect of student-teacher interactions has evolved to help students perform better. The concepts are more used within a class environment, known as active learning and flipped classroom (Bryson 2016; Freeman et al. 2014; Gilboy, Heinerichs & Pazzaglia 2015). These concepts require students to participate more, so that they might feel more engaged with the unit content compared to sitting and listening the lecturer.

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<sup>9</sup> The Australian Tertiary Admission Rank (ATAR) is the primary criterion for entry into most undergraduate-entry university programs in Australia. It is a number between 0.00 and 99.95 that indicates a student's position relative to all the students in their age group. Universities use the ATAR to help students select their courses.

#### **2.2.4.3 Learning and Teaching in an Online Environment**

Primarily in an education setting, the widespread use of Learning Management System (LMS) has changed the way students engage. The ubiquitous learning environment has also changed the students' behaviour to engage with their unit content, teachers, and with each other. According to Coates and colleagues, "LMS's ...through their [very] design, they influence and guide [learning and] teaching" (Coates, James & Baldwin 2005, p. 27). Learning management systems gather voluminous data on student online behaviour with the unit content which can be used to notify students about their progress. This thesis attempts to explore the student data in an LMS (Moodle based iLearn) for indicators of student engagement in a blended environment. There are questions around students' attitudes to learning, teachers' teaching behaviours, and students' interactions with each other and/or unit content within a unit environment. This thesis is an attempt to get answers to all these questions. Because of this, in our student perspective study we included questions around unit-specific learning and teaching factors (chapter 4).

#### **2.2.4.4 Interventions (Feedback) in Online Units**

As mentioned in chapter 1 regarding the motivation for this PhD thesis, that an LMS collects vast quantities of data on student and teacher behaviours but there is a lack of appropriate analytics (e.g. learning analytics) and information systems (e.g. student early alert system) which can assist extracting and interpreting the captured data which can be used to assist with contacting students when they are in need of support. It is important to identify the data in an LMS that can be used as indicators of student engagement. According to Kuh et al. (2005), early feedback or teacher interference can help students who have difficulties meeting institutional expectations. The teaching staff can provide or guide them with resources to enable students to catch up. Qualitative studies such as Singell and Waddell (2010) and Tinto (2012) summarise that early contact with students on the part of faculty, academic advisors, and other campus support staff can improve students' chances to succeed, persist, and graduate. Additionally, research studies (Jayaprakash et al. 2014; Singell & Waddell 2010) have shown that the earlier a student is identified as probably being in need of support, the better the opportunity they have to improve their academic performance. The first year for a tertiary student is a decisive time because usually a student will determine whether to continue or not

with their education. Yeager and Walton (2011) indicated that teaching staff, student support staff and department administrators should understand the (positive) effect of interventions and use them as a retention tool to identify the academic issues of students and provide timely support. Interventions within the first four to eight weeks of semester have been found to be instrumental in enhancing student success and increasing retention (Fusch 2011). Students are often highly apprehensive about seeking help, often due to uncertainty about what assistance is available, whom to approach, and issues around confidentiality (Kinnear et al. 2009). It was found, however, that once students are aware of the help available and know whom to approach, they develop a network of people who could assist them to become more confident to seek help in the future (Fusch 2011; Kinnear et al. 2009).

In its simplest form, the process involves a faculty member notifying students with an identified problem (alert) and intervene (offer support or refer to institution resources or support services) early before the student endures disengagement or failure (Donnelly 2010; Lynch-Holmes, Troy & Ramos 2012). The types of alerts (academic triggers) that are most likely to draw on student data captured in an LMS include missed workshops/tutorials, low scores in assessments or assignments, missing work, not logged in to the LMS (e.g. for more than a week), discussion postings (how many?), and lecture content or lecture resources not viewed (course view, resource view, URL view, assignment view).

#### **2.2.4.5 Student Support Services**

The institutional support services are essential to students' academic success as these support services or programs help students to overcome their shortcomings in areas of academic difficulty. Some examples of these support services or programs can be financial aid services, disability support unit, health and well-being, mentoring program, academic advising, basic study skills program, numeracy centre, services for International students and technology help. To facilitate the students and to increase their engagement and retention, in general, these institutional support services should meet the requirements of a typical enrolled student. In contrast, Devlin (2010) claim that instead of focussing on access for students from a diverse range of backgrounds, there should be a focus on a single area such as confidence and skills. For an institution to support and encourage

student progress appropriately, combined efforts are required from the faculty and student support services office. A recently conducted National Survey of Student Engagement-NSSE (2013) in the United States showed that the students persist if they experience their institutional support, not only to their academic activities but also to their wellbeing. Therefore, initiatives at the institution-level should be taken to float the message that student support is not only the responsibility of teaching and student support staff or a few support offices, it should be everybody's business.

The transition from high school to university is not easy. Students may face difficulties with issues such as feeling anxious and loneliness. These feelings usually have a negative impact on academic performance (Brar et al. 2012) and can be overcome only by providing an environment in which students feel engaged and part of the environment i.e. 'the sense of belonging'. In line with Astin (1985) and Tinto's (1993) research, Morrow and Ackermann (2012) found similar results that students perceiving a sense of belonging is correlated with retention. Asby (2015) supported the fact that sense of belonging influences student's opinions towards seeking help and using campus support services.

Students are individuals, so common reasons for them not to utilise support services vary from department to faculty and from faculty to institution. Some reasons can be universally generalised such as culture-related reasons, feeling too shy or embarrassed to ask for help, not wanting to bother teaching staff and/or concerns of being judged. However, factors such as age, gender, standardised test scores and conscientiousness (the tendency to be well organised and diligent) are found to be key determinants of student support services utilisation and academic success (Alarcon & Edwards 2013; Laskey & Hetzel 2011; Voyles 2011).

In a study evaluating a faculty/student mentor program on academic performance and retention showed that students involved in support services such as mentoring, have higher GPAs, more units completed per semester and lower dropout rates (Campbell & Campbell 2007). Research demonstrates that when students take part in support services such as academic advising, they feel better about their teaching staff and their institution (Kuh 2008; Pietras 2010; Schwebel et al. 2008; Teasley & Buchanan 2013).

The areas needed more research are accessibility to campus support services, timely referral of support to at-risk students and closing the loop by tracking the effectiveness of applied intervention/s. Given this and the need for early alerts, we included questions related to institution specific support services in our student perspective study (chapter 4).

## **2.2.5 The Theoretical Framework for this Study**

As discussed in section 1.4, the theoretical framework for this study was proposed as an eclectic model that draws on the earlier theories (section 2.2.3) and by inclusion of factors based on the review of the literature that contribute to student engagement and academic success (section 2.2.4). While student engagement/retention theories and models remain useful in elucidating the difficulties and processes' relating to student engagement and academic success, the relationship between the educational institution and student is lost between the simplicity and complexity of the various models (Swail, 1995). Therefore, without a clear explanation of what the model represents, it is difficult for administrators and practitioners to fully comprehend the significance of the model and how it relates to institution policy. Table 2.2 presents a synthesis of the key concepts among the different student engagement/retention theories and models that led to the identification of the factors in the theoretical framework for this study. The selection of these concepts was based on characteristics, requirements, issues and other features identified in the literature relevant to students' class and unit level engagement and their attitude towards an early alert and intervention such as whether students are willing to be contacted, what their preferences are concerning contact, whether they will change their behaviour, whether they will give access to their data. These concepts are briefly discussed again in chapter 3 (section 3.8) with the identification of student success data held in our institutional systems and chapter 4 section 4.3.3 (sub-section 4.3.3.1) with the questionnaire development process. The institutions learn how to act on these theoretical structures through the collection of data to further understand the attitudes, behaviours and cognition of students at the unit-level.

**Table 2.2: Synthesis of Key Concepts Addressed in Theoretical Framework for this Study**

<b>Factors</b>	<b>Tinto's Theory</b>	<b>Bean's Theory</b>	<b>Astin's Theory</b>	<b>Swail's Theory</b>	<b>Theoretical Framework</b>
Age		X	X		X
Gender	X	X			X
Ethnicity	X	X	X		X
Student status (FYFS, FYSS, continuing student or came from another university)					X
Student enrolment (full-time/part-time)					X
Family responsibility	X	X		X	X
Hours of employment	X	X			X
Health issues					X
Religious commitment or activities				X	X
Preparedness (skills/academic abilities to undertake a unit)	X	X	X	X	X
Sense of belonging (emotional engagement to teachers and peers)	X	X	X	X	X
Student opinions and preferences with respect to early alerts/interventions					X
Students' permission to access their data					X
Attitude towards being contacted (early alert/intervention)				X	X
Intervention impact in behaviour to study for a unit					X
Intervention impact on student performance and motivation to continue in a unit				X	X
Attitude towards unit related support				X	X
Student academic support provided by the institution	X	X	X	X	X
Helpfulness of student support services			X	X	X

Some of the factors identified by four of the researchers are related to student characteristics such as preparedness and sense of belonging but others were related to institutional characteristics such as academic support. Interestingly age and gender were not identified by all four of the authors as important factors.

## 2.3 Analytics in Higher Education

In general, analytics has a major influence on our everyday life from education, health, shopping, politics and events. For example in education, analytics can help to understand the process of student learning and how to improve it (Johnson, Becker & Hall 2015). In healthcare, analytics can help in medical research to learn more about certain diseases and their cure. In sports, it can help to evaluate the

performance of teams or individual players (Cade 2012). Even in the 2012 US elections, it was said that big data and analytics played an essential role (Shen 2013). Watson (2011) indicated that:

“Analytics means different things to different people. There are very different kinds of analytics, and the differences have important implications for where they are used, who performs them, the skills that are required, and the technologies that are involved...”

Along the same lines, Hawkins suggested that analytics should be more a goal-directed practice rather than a one-size-fits-all attempt (Hawkins 2008). The goal of this thesis is not to present the different descriptions of the various types of analytics being discussed in the literature. From the literature, we have learned that a variety of terms are used for analytics in higher education such as Educational Data Mining (EDM), information visualisation, academic analytics, learning analytics and action analytics. Out of these, EDM and academic analytics are closely connected fields of learning analytics. Ferguson illustrate them as challenges driving the analytics research with EDM focused on technical challenge, academic analytics focused on political/economic challenges and learning analytics focused on educational challenges (Ferguson 2012a, p. 8). A brief description of them was already presented in the introduction section of chapter 1. Next, we present a conceptual positioning of EDM, academic and learning analytics in the academic domain.

### **2.3.1 Educational Data Mining**

According to the educational data mining society (EDM, 2018), EDM is the combination of data mining techniques/methods with educational data. Researchers in this field work towards developing methods to understand students' learning processes to generate useful information (patterns or trends) from the educational data (Baker & Yacef 2009; Hung, Hsu & Rice 2012; Romero & Ventura 2010). Both learning analytics and EDM are closely related fields in terms of goals, analysis domain, data and processes. For example, both fields have a similar objective i.e. to improve the learning process; both have applications in the educational domain; both use data from the educational environment to convert relevant data into relevant information. The difference between the two fields comes in when we talk about the techniques. Typical data mining techniques such as clustering and classification are mainly used in EDM. On the other hand, learning

analytics uses statistics, information visualisation<sup>10</sup> and/or social network analysis<sup>11</sup> in addition to data mining techniques.

### **2.3.2 Academic Analytics**

The term academic analytics was first used in 2005 (Goldstein & Katz 2005). By definition, it is an overlapping term with learning analytics. For example, the following description about the academic analytics can also be used for learning analytics. Campbell and Oblinger (2007) stated in their abstract:

“Academic analytics can help institutions address student success and accountability while better fulfilling their academic missions (competing for student enrolment). Academic systems generate a wide array of data that can predict retention and graduation. Academic analytics marries that data with statistical techniques and predictive modeling to help faculty and advisors determine which students may face academic difficulty, allowing interventions to help them succeed.”

There is a fine line between both fields. Academic analytics is the application of business intelligence in education. Learning analytics, in contrast focus on the learning process which may include analysing the relationship between students, unit content and teaching staff. To keep it simple, we are going to summarise the difference in level of analysis and stakeholders (Siemens & Long 2011). Academic analytics is positioned more at the institutional level (such as student profiles, performance of teaching staff, quality of unit and unit design etc.), regional/national or international (comparing performance with other universities) level. The stakeholders can be educational institution administrators and marketing people, funding agencies and governments. While, learning analytics is located more at the course/program level (such as learning trails, social networks, discourse analysis) and uses EDM beside statistics and information visualisation. The stakeholders can be students, teaching staff and academic advisors or counsellors.

### **2.3.3 Learning Analytics**

To understand learning analytics within the context of this research, the following sections describes the various definition/s, processes and model/frameworks, benefits and challenges related to the field.

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<sup>10</sup> Information visualisation (IV) helps to present and summarise the learning analytics information in dashboards or other visual formats rather than in large tables.

<sup>11</sup> Social network analysis (SNA) provide tools to explore and analyse networks of people based on graph-based visualisations (also known as social network diagrams).

### 2.3.3.1 Learning Analytics Definition

Learning analytics is still in its infancy as it is less than a decade since research has started in this area. Similar to any new research area, many attempts are made to define learning analytics. The following table (Table 2.3) presents the important definitions within the context of this research. Though somewhat different, all the definitions (Table 2.3) share a common concept that is the conversion of student academic data into useful information to help teachers and student learning. Therefore, in this research learning analytics is used to understand student engagement and behavioural data (such as interactions with the LMS, teachers, peers and the unit content) in the LMS setting. The goal is to help students at the unit-level. One of the ways this can be achieved is by identifying students' (via early alert system/tool) in need of support and by providing timely interventions (by the teaching staff).

**Table 2.3: Learning Analytics Definitions**

<b>Definition</b>	<b>Reference</b>
"Learning analytics is the use of intelligent data, learner-produced data, and analysis models to discover information and social connections, and to predict and advise on learning"	(Siemens 2010, para 1)
"Learning analytics focuses on building systems able to adjust content, levels of support and other personalised services by capturing, reporting, processing, and acting on data on an ongoing basis in a way that minimises the time delay between the capture and use of data."	(Elias 2011, p. 4)
"Learning analytics is the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimising learning, and the environments in which it occurs."	(Siemens & Long 2011, p. 34)
"Learning analytics focuses on the learner, gathering data from course management and student information systems to manage student success, including early warning processes where a need for interventions may be warranted."	(van Barneveld, Arnold & Campbell 2012, p. 6)
"The promise of learning analytics is the empowerment of teachers and students to understand the wealth of data that relates to their learning."	(Clow 2013, p. 18)
"...use of (big) data to provide actionable intelligence for learners and teachers"	(Ferguson, 2014, slide 4) <sup>12</sup>

<sup>12</sup> <https://www.sconul.ac.uk/sites/default/files/Rebecca%20Ferguson%20-%20201345hrs%2027%20June.pdf>

### **2.3.3.2 Learning Analytics Processes, Models or Frameworks**

In the literature and on the web, there are numerous attempts to describe the learning analytics process, models or frameworks, techniques and algorithms. After an extensive review of the literature, we summarised that learning analytics is constructed upon the research findings of several related fields like web analytics, business intelligence, data mining, statistics, social network analysis, recommender systems, educational theory and practice. Next, in Table 2.4 we attempt to summarise the theoretical contributions like processes, model or frameworks in the field of learning analytics. This activity helped us in two ways. First, to identify what models exist and second, if there are any guidelines to follow that indicate a particular model is helpful in an implementation of learning analytics.

### **2.3.3.3 Learning Analytics Benefits**

The application of learning analytics (tools or systems) can be directed towards stakeholders. In information systems, the term *stakeholder* is used to refer to a person or a group who will be affected by the system, directly or indirectly. In the last few years, several studies on the benefits of learning analytics have been published (Adejo & Connolly 2017; Arnold & Pistilli 2012; Avella et al. 2016; Conde & Hernández-García 2015; de Freitas et al. 2015; Dietz-Uhler & Hurn 2013; Dinu et al. 2017; Greller & Drachsler 2012; Ifenthaler 2017; Lawson et al. 2016; Lu et al. 2017; Mah 2016; Papamitsiou & Economides 2014; Prinsloo, Slade & Galpin 2012; Reyes 2015; Serrano-Laguna & Fernández-Manjón 2014; Siemens 2013; Stewart 2017; Wong 2017).

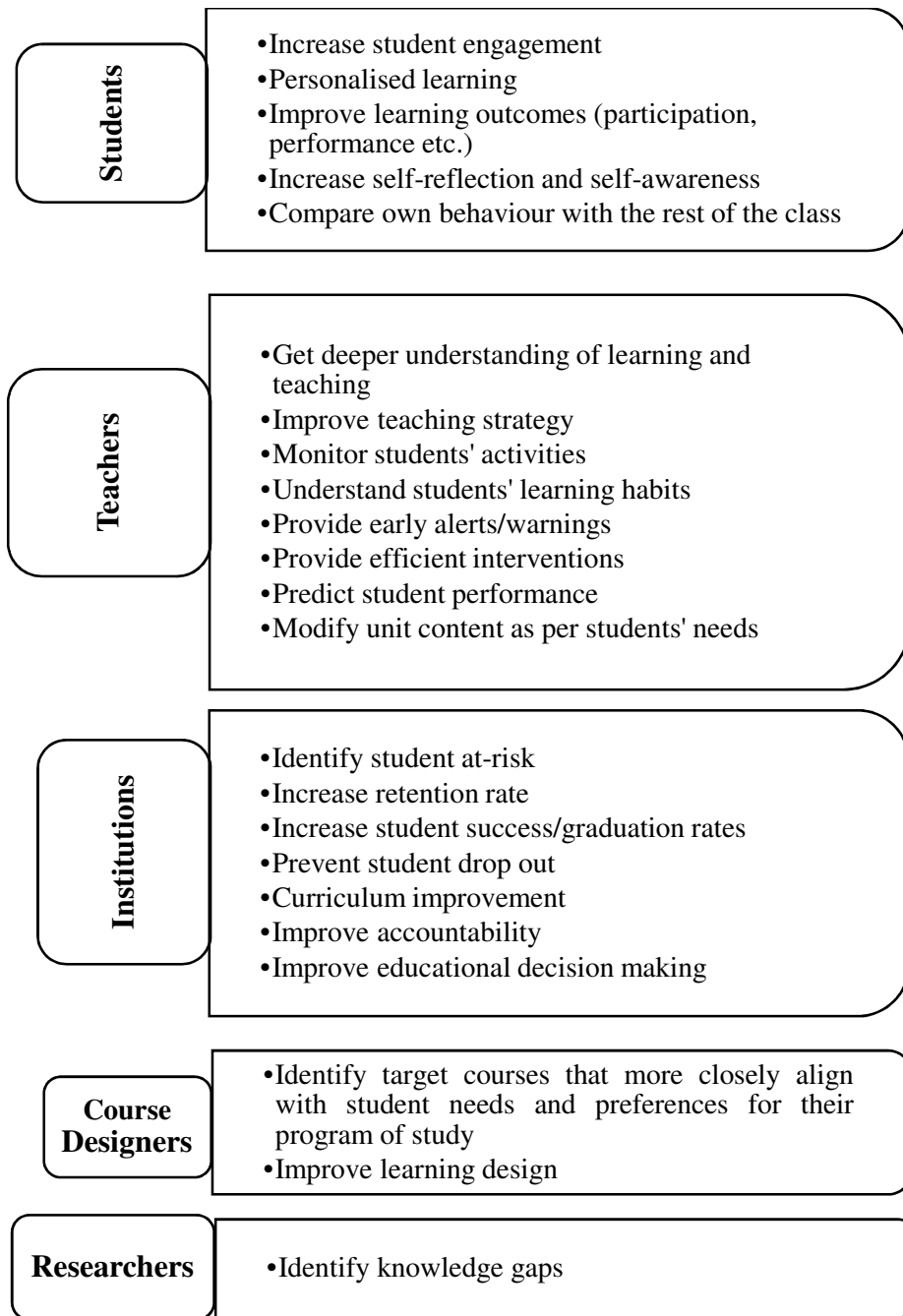
In Figure 2.1, the benefits are grouped for stakeholders. The *stakeholders* for learning analytics are students/learners, teaching staff, institutions, course designers and researchers.

**Table 2.4: Learning Analytics Theoretical Contributions**

<b>Description</b>	<b>Reference</b>
<b>Processes</b>	
Knowledge Continuum (linear process): (1) data; (2) information; (3) knowledge; (4) wisdom	(Baker 2007)
The five steps of analytics: (1) capture; (2) report; (3) predict; (4) act; (5) refine	(Campbell & Oblinger 2007)
Web analytics: (1) define goals; (2) measure the outcomes; (3) use the resulting data to make improvements; (4) share the data for the benefits of others	(Hendricks, Plantz & Pritchard 2008)
Collective application model: (1) information gathering-select and capture; (2) information processing-aggregate and process; (3) information presentation-display	(Dron & Anderson 2009)
Processes of learning analytics: (1) select; (2) capture; (3) aggregate & report; (4) predict; (5) use; (6) refine; (7) share	(Elias 2011)
Three phase model (iterative cycle): (1) data collection and pre-processing; (2) analytics and action; (3) post-processing	(Chatti et al. 2012)
Learning analytics cycle: (1) learners; (2) data; (3) metrics; (4) interventions	(Clow 2012)
Learning analytics process model: (1) awareness; (2) reflection; (3) sense making; (4) impact	(Verbert et al. 2013)
<b>Models/Frameworks</b>	
Reference model for learning analytics: <ul style="list-style-type: none"> <li>• What? What kind of data is used for the analysis?</li> <li>• Who? Who is targeted by the analysis?</li> <li>• Why? Why does the system analyse the collected data?</li> <li>• How? What techniques will be used for the analysis of the collected data?</li> </ul>	(Chatti et al. 2012)
Design Framework of learning analytics: (1) stake holders; (2) objectives; (3) data; (4) instruments; (5) external constraints; (6) internal limitations	(Greller & Drachsler 2012)
5E+I/A inquiry model: Adds the intervention and acceleration steps to the 5Es (engage, explore, explain, elaborate, evaluate) and intervention/acceleration	(Monroy, Rangel & Whitaker 2014)

Description	Reference
<b>Models/Frameworks</b>	
RAPID Outcome Mapping Approach: This seven-step model is adapted for the learning analytics context. (1) define a clear set of overarching policy objectives; (2) map the context; (3) identify the key stakeholders; (4) identify learning analytics purposes; (5) develop a strategy; (6) analyse capacity and develop human resources; (7) develop a monitoring and learning system	(Ferguson et al. 2014)
Framework of quality indicators for learning analytics: The five criteria (1) objectives (contains the quality indicators awareness, reflection, motivation and behavioural change); (2) learning support (contains the quality indicators perceived usefulness, recommendation, activity classification and detection of students at risk); (3) learning measures and output (contains the quality indicators comparability, effectiveness, efficiency and helpfulness); (4) data aspects (contains the quality indicators transparency, data standards, data ownership and privacy); (5) organisational aspects (contains the quality indicators availability, implementation, training of educational stakeholders and organisational change)	(Scheffel et al. 2014)
Open Academic Analytics Initiative (OAAI) predictive modeling architecture	(Jayaprakash et al. 2014)
Three big data analytical models: (1) descriptive analytics; (2) predictive analytics; (3) prescriptive analytics to support association, triggering and assessment	(Daniel 2015)
Learning analytics model (LAM): (1) develop a learning analytics strategy; (2) commit to create an infrastructure for big data integration; (3) learner-centred service; (4) dynamic look at the students' learning journey; (5) adaptively model user behaviour; (6) linking learning analytics within a wider dynamic context; (7) qualitatively driven crowd-sourced hypotheses formation; (8) rigorous view of ethics and adherence to highest standards of ethical procedures; (9) external as well as internal review and cross-validation processes	(de Freitas et al. 2015)
Model for instructional effect of feedback: (1) learners initial state; (2) search and retrieval strategies; (3) response; (4) evaluation; (5) adjust initial state	(Timmers, Walraven & Veldkamp 2015)
Social networks-based model for understanding learning and performance: Studies the association between social networks, content richness in academic learning discourse and performance	(Chung & Paredes 2015)

Description	Reference
<b>Models/Frameworks</b>	
Community of Inquiry model (CoI): The model describes the educational experiences in communities of learners through the three interdependent dimensions such as (1) cognitive presence; (2) social presence; (3) teaching presence	(Kovanović et al. 2015)
Course engagement model: Course behaviours that reflect course engagement such as counts of logins, days, hours spent, posts viewed, posts authored	(Lowes, Lin & Kinghorn 2015)



**Figure 2.1: Benefits of Learning Analytics for Stakeholders**

#### **2.3.3.4 Learning Analytics Challenges**

From the literature, we have learned that the challenges of learning analytics are discussed under different headings. Some researchers refer to it as directions for future learning analytics research while others identify them as technical or educational challenges. Since 2012, many researchers have publications with a section on challenges of learning analytics (Avella et al. 2016; Chatti et al. 2012; Dawson et al. 2014; Drachsler & Greller 2016; Ferguson 2012a; Gasevic, Dawson & Jovanovic 2016; Gašević et al. 2016; Gašević, Dawson & Siemens 2015; Gursoy

et al. 2017; Ifenthaler & Tracey 2016; Knight, Shum & Littleton 2014; Lockyer, Heathcote & Dawson 2013; Macfadyen & Dawson 2012; Pardo & Siemens 2014; Rubel & Jones 2016; Siemens 2013; Slade & Prinsloo 2013; Stewart 2017; West, Heath & Huijser 2015; Willis, Slade & Prinsloo 2016; Wintrup 2017). In Table 2.5, the challenges related to learning analytics were grouped in terms of technical and non-technical challenges.

**Table 2.5: Challenges of Learning Analytics**

<b>Technical Challenges</b>	<b>Non-Technical Challenges</b>
Data tracking	Scope and quality of data
Data collection	Data governance
Data evaluation	Data ethics
Data analysis	Data privacy
Data integrity	Data protection
Emerging technology (development of tools and their integration in learning and teaching)	Connection to theoretical and educational foundations (learning theories, pedagogical considerations etc.)

Of all the challenges, technical or non-technical, discussed in the literature, the data ethics and privacy issues are the most discussed. In a guest editorial of the Journal of Learning Analytics, Ferguson et al. (2016) identified a list of 21 learning analytics challenges with ethical dimensions. Out of 21 challenges, 12 are related to ethics such as to gain informed consent, use data to benefit students, ensuring accuracy and validity of analysed results, present data or results in a way that supports learning and to provide accurate and timely data to name a few. Of the remaining, seven are related to data protection and two to data privacy. These ethical and privacy related criticisms of learning analytics hinder the development of the field. Sclater and Bailey (2015) proposed a ‘code of practice’ for learning analytics. The code was grouped into a taxonomy of ethical, privacy and legal issues for learning analytics. These groups were as follows; (1) responsibility; (2) transparency and consent; (3) privacy; (4) validity; (5) access; (6) enabling positive interviews; (7) minimising adverse impacts; and (8) stewardship of data.

Data privacy, protection and ethical considerations are important for the development of learning analytic applications such as early alert systems or tools. The lack of student consent to the use of their personal or academic data, transparency in collecting, analysing and reporting of student data from the various HEI systems and opt-in/opt-out function might lead to ineffective analytics results.

Therefore, consideration of ethics and privacy is one of the biggest challenges in learning analytics as it can influence the success of any learning analytics tool.

## **2.4 Early Intervention in Higher Education**

In the present higher education setting, accountability, retention, and graduation rates are the most researched topics around the important issues universities are facing. HEIs face potential decreases in funding if retention and graduation goals are not met (Department of Education Employment and Workplace Relations 2009)<sup>13</sup>. At a national level, many HEIs are working diligently to find new ways to retain students and innovative systems to monitor their students' academic performance (Siemens, Dawson & Lynch 2013). Specifically, the use of early alert systems is helping gradually to bridge the gap between students, teachers, and campus support services. Typically, a student early alert system contacts a student regarding their engagement and performance and provides students with a sense that someone is concerned about their academic success (Bradley & Blanco 2010; Swail 2004). Seidman (2005) described early intervention in higher education as an early contact point to inform an at risk student about their performance.

The following sections present summaries of a selection of international and Australian early alert systems that can have different target groups, such as teachers, students, researchers, moderators, and instructional designers. Since this thesis focuses on student and teacher perspectives towards early alert systems that use performance and student behavioural indicators to track and improve student engagement and academic success, the related discussion is mostly focused on projects with similar goals or features.

### **2.4.1 Early Alert Systems/Tools**

Generally, these systems refer to a formal, intentional process of identifying the at-risk students to monitor their academic performance. They are also known as early

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<sup>13</sup> Since 2009, this issue is bandied around in parliament but has not been pushed through. There was a similar provision proposed in the Higher Education Reform Package (May 2017) but the Australian Government that was proposed but not actioned yet. Details can be found at the following URL. [https://docs.education.gov.au/system/files/doc/other/ed17-0138\\_-\\_he\\_-\\_glossy\\_budget\\_report\\_acc.pdf](https://docs.education.gov.au/system/files/doc/other/ed17-0138_-_he_-_glossy_budget_report_acc.pdf)

warning, student tracking, early advantage, early intervention, or early alert referral systems.

Lynch-Holmes, Troy and Ramos (2012, p. 2) put forward the concept as:

“Early alert and intervention is a systematic program or initiative within higher education designed to identify and support students at risk of attrition in order to improve student success, retention and persistence.

Early alert and intervention is comprised of two key components:

- Alerts - a formal, pro-active feedback system through which student-support agents are alerted to ‘red flags’ regarding student success as early as possible.
- Intervention - a strategic method of outreach to positively respond to red flags or alerts in order to provide intrusive and individualised interventions to students in need.”

Such systems are developed to identify and intervene with at-risk students to prevent attrition and promote student academic success. Formal, proactive, and prompt feedback to early manifestations of poor academic performance or academic disengagement to students and to those who can assist students are an essential element in the effectiveness of these systems (Tinto 2012). Moreover, Bradley and Blanco (2010) in their report “Promoting a culture of student success” summarised the successful strategies for student success. Based on their analysis of 15 US higher education institutions’ successful approaches to improving graduation rates and student success they suggested that (beside other strategies) early alert systems/tools are one of the best contemporary strategies employed by institutions to approach the retention problem.

Early alert systems and intervention models are not the same (Burns, Appleton & Stehouwer 2005). There are currently a variety of institution specific systems developed in-house and/or developed using commercial software that presents a black box to the institution to meet their needs more efficiently (Liu et al. 2015b). The goal of an alert system is to identify students exhibiting ‘at-risk’ behaviour and designing interventions to mitigate that risk in order to get them back on track (Essa & Ayad 2012a). Swail (2004) explained that effective early alert systems should include integration of student support services, data collection, assessment, and institutional communication networks. Levitz and Noel (2000) noted that early identification, intervention, and good academic advising were direct keys to retention. The literature on learning analytics is overflowing with studies on the use of such systems and data in US, UK and Europe (Cai, Lewis & Higdon 2015;

Cochran et al. 2014; Dietz-Uhler & Hurn 2013) to understand student performance with the goal to identify indicators, track, and improve student academic success. Jackson and Read (2012, p. 2) outlines, “A review of the Australian tertiary student experience found very little evidence of the use of systems/technology that enabled and supported the implementation of automated early alert systems”. Reported findings concerning these systems mostly represent small enrolments and sample sizes, instructional conditions and learning design (Gašević et al. 2016; Lockyer, Heathcote & Dawson 2013; Simons 2011). Lynch-Holmes, Troy, and Ramos (2012) advise that there are few definitive best practices for their implementation and development. Although widely-accepted as effective, and ever-increasing in implementation frequency, such systems are relatively new in the Australian higher education landscape (Colvin et al. 2015; Johnson, Becker & Hall 2015; Siemens, Dawson & Lynch 2013; West, Heath & Huijser 2015).

Services delivered through early alert systems provide innovative ways for institutions to transition students from high school to university successfully. In combination with intervention strategies, early alert systems help students to improve their performance in their units/courses (Wolff & Zdrahal 2012; Wolff et al. 2013). Fuchs and Fuchs (2006, p. 1) found that “when instructors use systematic progress monitoring to track their students’ progress...they are better able to identify students in need of additional or different forms of instruction, they design stronger instructional programs, and their students achieve better”. Furthermore Safer and Fleischman (2005) added, students become vigilant and pay more attention to their studies when teachers monitor their progress.

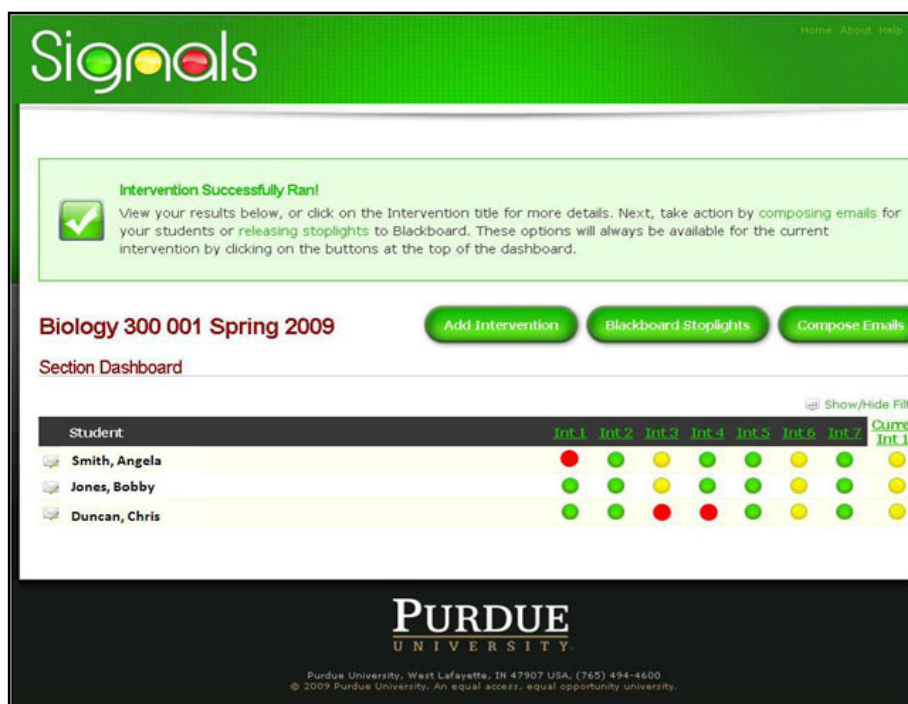
The following sections (2.4.1.1-2.4.1.3) were written to review different early alert tools/systems to inform the current study how the student academic data at a unit-level has been used to improve student engagement, academic success, and retention. It is important to note here that the intention to summarise these sections is not to evaluate any of these early alert tool/system(s).

#### **2.4.1.1 International Case Studies**

##### ***2.4.1.1.1 Purdue University, North America - Course Signals***

In 2003, Purdue initiated the use of analytics to improve their students’ experience (Arnold 2010). An initial attempt was the development of ‘The Purdue Early

Warning System' (PAWS) now called 'Course Signals' (Figure 2.2). The Course Signals mine data from a student information system, course management system and the grade book. The Course Signals is grounded on an in-house developed statistical student success algorithm (SSA) which can identify students academically at-risk (Arnold 2010).



**Figure 2.2: Faculty view of the Course Signals Dashboard**

The Course Signals flag students at-risk based on demographic information and grade performance. With the aid of a traffic-light approach, teachers are able to send intervention emails and provide feedback to students who are doing well, indicated by a green light ('low risk'); those in danger of falling behind, indicated by an amber light ('moderate risk'); and those in danger of failing indicated by a red light ('high risk'). Teachers at Purdue use Course Signals in their own time to help students in need of support to change their learning behaviour. The publicly available literature on Course Signals shows that those teachers who decide to use Course Signals into their course/s can customise an intervention schedule. Customisation includes e-mails and reminders, text messages, and referrals to academic advisors or resource centres.

The self-reflexive aspect of Course Signals allows students to view their own profiles so they can monitor their progress (Arnold 2010). Students do not directly use Course Signals but can view their signal within Blackboard (LMS at Purdue).

Ferguson (2012b) noted that the development of Course Signals became a ‘flagship’ for academic and action analytics. As Arnold (2010) reported, results from the Course Signals usage between 2007 and 2009 indicated a 12 percent increase in the number of students attaining B and C grades and a 14 percent reduction in D and F grades for those students in the experiment group using the tool. The Course Signals tool is used in over 100 courses taught by 162 instructors, where more than 25,000 students were experiencing the analytics tool (Arnold & Pistilli 2012).

Beside the interesting findings from the Purdue Signals project, few researchers such as Michael Caulfield, director of blended and networked learning at Washington State University at Vancouver and Alfred Essa, vice president of research and development and analytics McGraw-Hill Education analyses the institution’s claims regarding the validity of the data and/or predictive algorithm simulations to increase in retention rates. Caulfield<sup>14</sup> pointed out a selection bias and was doubtful of some of Purdue’s claims of the improved retention of students using Course Signals, especially the students taking two or more courses were 21% more likely to be retained. Alfred Essa<sup>15</sup> also disputed Purdue’s claim and wrote a simulation to test the statement that there was an increase in retention rates for students who took Course Signals courses rather than non-Course Signal students. He concluded that the aim of the early alert systems at the course level should be just to make sure that students are performing well rather than claiming a direct increase in retention rates.

#### ***2.4.1.1.2 Baylor University, North America - Academic Referral System***

The early alert system used at Baylor University is called the Academic Referral System<sup>16</sup>. The system has two functionalities: (1) make referrals and (2) academic warnings (Figure 2.3).

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<sup>14</sup> <https://hapgood.us/2013/09/26/why-the-course-signals-math-does-not-add-up/>

<sup>15</sup> <http://alfredessa.com/2013/10/can-we-improve-retention-rates-by-giving-students-chocolates/>

<sup>16</sup> [http://www.baylor.edu/support\\_programs/index.php?id=58168](http://www.baylor.edu/support_programs/index.php?id=58168)

**BAYLOR** Academic Support Programs  
Paul L. Foster Success Center

The Foster Success Center | I Need Help With... | I Need To Find ... | I Need to Learn About ... | Search PLFSC | Go

Baylor > Office of Academic Support Programs > Academic Referral System

### Academic Referral System

Use of this online tool is restricted to Baylor faculty and staff. If you are not a faculty/staff member at Baylor University and you have an academic concern about a student, please call Ronald English (254) 710-8986.

Welcome to the online Academic Referral System. Thank you for your investment in the students' success here at Baylor University in this rigorous academic environment.

**MAKE A REFERRAL** **ACADEMIC WARNINGS**

**When to refer students?**  
As soon as there is a concern! Academic intervention early in the semester allows time and opportunity for students to reverse patterns of inadequate academic performance. The program enhances student success by providing academic services/resources to students about whom faculty have academic concerns. Academic success will complement the classroom environment and increase retention of students.

**When to use the system?**  
Faculty members are encouraged to refer students early in the semester who exhibit academic, social, or emotional difficulties. Students should be referred for any of the following reasons:

PLFSC Departments

**Figure 2.3: Baylor's University Academic Referral System**

According to the university management, faculty members at Baylor University are encouraged to refer students to the university support services early in the semester for any of the following reasons: failure to attend class or excessive absences; missing or failing an exam; poor performance on quizzes; missing assignments; and no or poor class participation (Figures 2.4).

**Paul L. Foster Success Center**  
Log out

EDC 1200 N2 Col Rdg & Study Skills Bobby Baylor - 891234567

**Student Contact**

Attempts made to contact the student

- ☐ No attempts
- ☐ 1 attempt
- ☐ 2 attempts
- ☐ 3 or more attempts

Has student responded

- ☐ Yes
- ☐ No

**Attendance records (Skip this section if there are no issues with attendance.)**

Course meets

- ☐ 1 time per week
- ☐ 2 times per week
- ☐ 3 times per week
- ☐ More than three times per week

Number of absences

- ☐ 1-3 absences
- ☐ 4-6 absences
- ☐ 7-9 absences
- ☐ 10-12 absences
- ☐ According to University policy, student has failed course
- ☐ Never attended class

**Classroom Performance (Check all that apply.)**

- ☐ Poor performance on one or more exams
- ☐ Missed an exam
- ☐ Poor performance on quizzes
- ☐ Missing assignments
- ☐ Unprepared for class sessions
- ☐ No or very poor class/group participation

**Comments:**

Forward Referral Cancel

**Figure 2.4: Faculty view of the how to make a referral**

### 2.4.1.1.3 Northern Arizona University, US - Grade Performance Status (GPS)

Grade Performance Status<sup>17</sup> (GPS) is Northern Arizona University's online early alert system to aid teacher-student interactions (Figure 2.5). GPS fetches data from the university LMS, Blackboard Learn. Through the GPS interface teachers can send personalised academic (e.g. attendance and grade) and general comments. The enrolled students get feedback/interventions in their emails directly from the teacher's mailbox which provide them an opportunity to directly connect with their teacher. In the personalised email, the teacher can also include action prompts, important university deadlines, and links to the university support services. Students are notified about new messages in MyNAU (student portal). GPS is a dashboard of information for students, teachers, and other university staff. All comments automatically get saved in GPS and a historical record is generated for teachers to review earlier sent comments. On the other hand, each comment sent is also documented in the student database which makes teachers' response/reply available for academic advisors, support staff, student services, and department/faculty administrators in the form of reports.

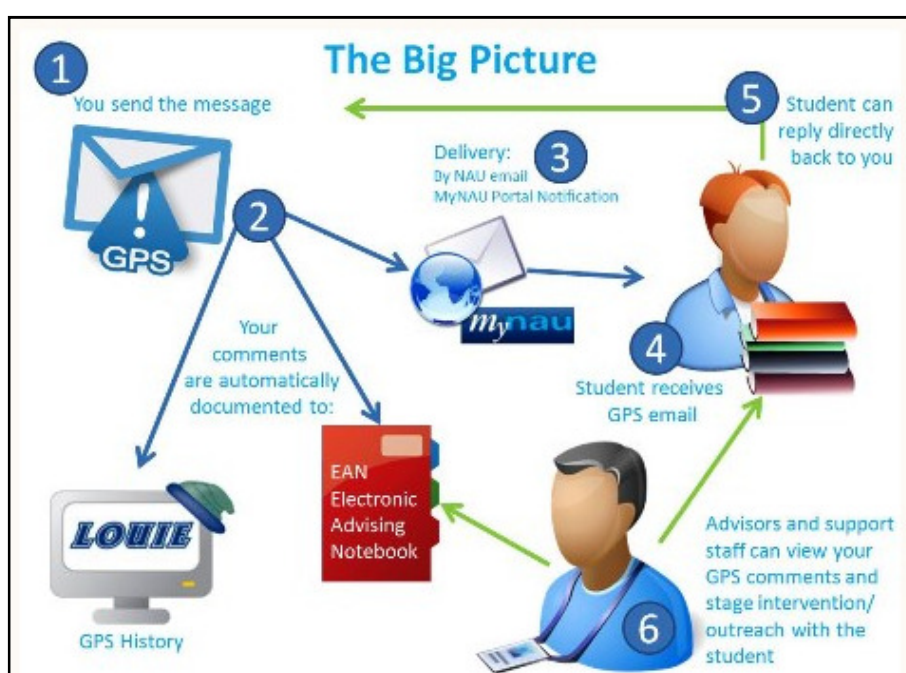


Figure 2.5: Northern Arizona University's early alert process using GPS

<sup>17</sup> <http://nau.edu/University-College/GPS/Instructors/About/>

#### 2.4.1.1.4 University of Michigan, US - E<sup>2</sup>Coach

The University of Michigan designed their student support and intervention system E<sup>2</sup>Coach<sup>18</sup>. It identifies at-risk students based on student self-reported data and data from Science, Technology, Engineering, and Mathematics (STEM) disciplines (Figure 2.6). Instead of teachers alone, the coaching team uses this system, which includes teachers, senior students and other experts in the domain who have successfully completed their STEM-related degrees. Members of the coaching team are matched with current students based on similar backgrounds and common goals. E<sup>2</sup>Coach is built on an intervention engine (Michigan Tailoring System) that provides personalised feedback to students and uses predictive analytics to make recommendations (e.g. study plan, practice questions) to disengaged or low performing students.

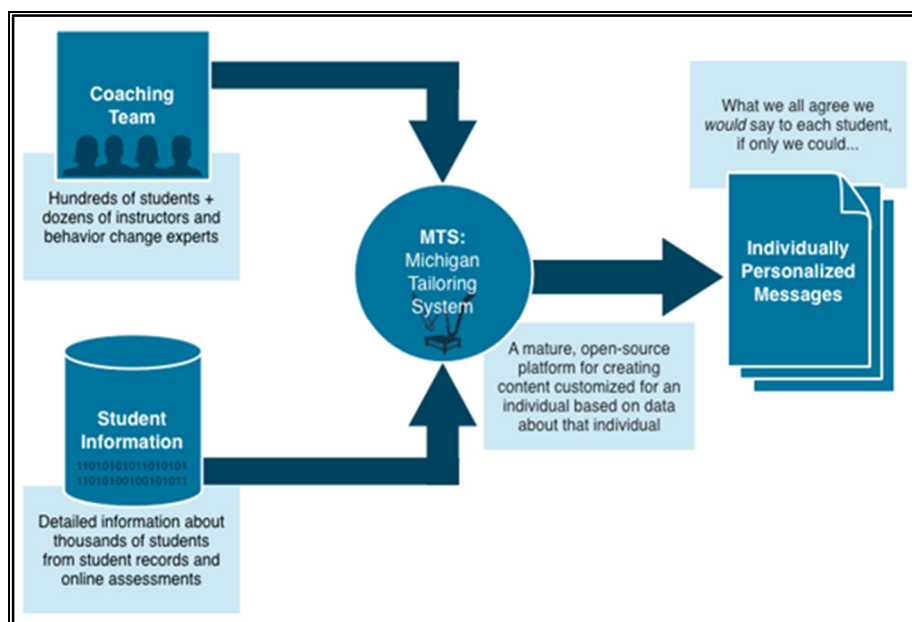


Figure 2.6: E<sup>2</sup>Coach Process Model

#### 2.4.1.1.5 The Open University, UK - OU Analyse

The Open University, UK designed their early prediction and personalised activity recommender system OU Analyse Dashboard<sup>19</sup>. The key objective is to considerably improve the student experience and retention at the Open University. The OU Analyse uses student demographic data (such as age, previous education, gender, the number of credits the student is registered for, number of times the

<sup>18</sup> <http://e2coach-tailoring-support-for-students-in-introductory-stem-courses>

<sup>19</sup> <https://analyse.kmi.open.ac.uk/#dashboard>

student previously attempted the course), financial data, disability flags, student assessment data (such as Tutor Marked Assessments [TMAs] as well as final exam) along with the students' interactions (such as accessing a resource, student forum) within the virtual learning environment (VLE) (Kuzilek et al. 2015). The OU Analyse uses a range of machine learning and advanced statistical approaches to classify and predict at-risk students. The outcome is that on a weekly basis, the lists of at-risk students are made available to the course/module tutors and the Student Support Team (SST) members to provide appropriate support.

The OU Analyse dashboard also provides teachers with information about their students' performance (see Figure 2.7). This information includes the average performance of the cohort, the list of all students and the predictions of their performance in the next assessment tasks (Herodotou et al. 2017).



Figure 2.7: The OU Analyse Dashboard

#### 2.4.1.2 Australian Case Studies

The following university-specific tools illustrate a combination of alternative purposes and goals of learning analytics. The bigger objective behind all the tools is to improve student success and retention and to understand reasons for student disengagement and attrition. All tools were developed and implemented at Australian universities. Some of the tools are not publically available and most

others only seem to work within very specific environments, although they may have been designed in a more general spirit.

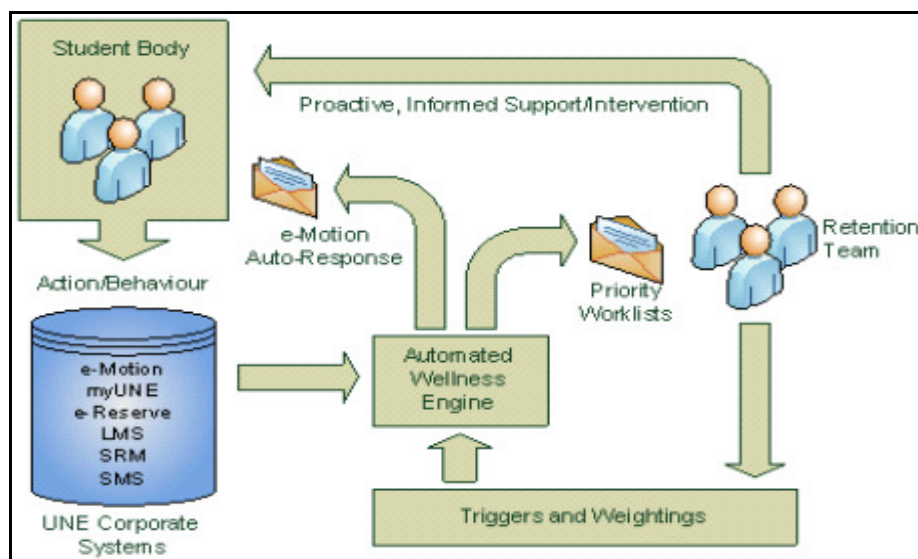
#### ***2.4.1.2.1 University of New England (UNE), NSW - Automated Wellness Engine (AWE)***

The Automated Wellness Engine (AWE) is an early alert engine designed and built to enhance student engagement and retention at UNE (Figure 2.8). As Rhonda Leece, Assistant Director, Student Services, UNE says in a 2011 media release (<http://www.pcworld.idg.com.au/mediareleases/12169/university-of-new-england-goes-live-with-altis/>) (para. 5), “...It’s a systems-driven strategy delivering personal connections that make distance education students feel part of the university”. The AWE is based on the successful emoticons identification activity embedded in the online UNE student portal (myUNE) and other data in different university systems (e-Motion, e-reserve, LMS, SRM-student relationship management, SMS-student management system, unit discontinuation poll and the Vibe) related to learners interactions with the university and their teachers, use of facilities and their responsiveness to deadlines. The AWE’s, ‘evidence-based system of retention’ helps to identify high-risk learners who may be struggling or experiencing disengagement from their courses (Leece & Hale 2009).

Based on the indicators, the AWE generates daily or weekly wellness reports. Daily wellness reports are generated which allow the student support team to identify individual students. Weekly wellness reports identify trends (not individual student information) across units and departments which enable the support team to provide feedback to faculty. Consolidated weekly reports are also generated which allows unit co-ordinators and heads of department(s) to determine areas of need in relation to the units being taught. It is important to note that UNE did not do any predictive modelling prior to setting up their program. They are now considering modelling retrospectively.

In a 2011 media release (<http://www.pcworld.idg.com.au/mediareleases/12169/university-of-new-england-goes-live-with-altis/>) (para. 4), UNE reported that “unit attrition rates for students involved in the trials showed a significant decrease, falling by 7.5 percent during

the semester”. Beginning in session 1 2011, the AWE has been made available to all students at the University.

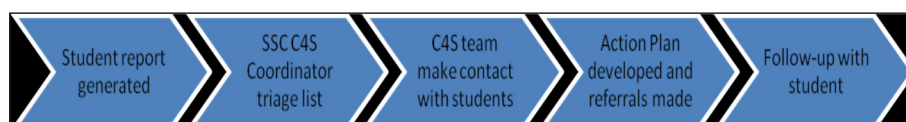


**Figure 2.8: University of New England's Automated Wellness Engine (AWE)**

#### **2.4.1.2.2 Edith Cowan University (ECU), WA - Connect for Success (C4S)**

The C4S is a pro-active, university-wide, and fully automated system based on enrolment data, pre-determined triggers (demographic data, behavioural data, student survey, and self-report), and triggers fed from the other data sources (Blackboard, RightNow, academic referrals, mid semester grades) that systematically identify students who are likely to require extra support to complete their studies. Once students have been identified, they are referred onto the appropriate services within the university by the Student Connect Team.

This early warning tool seeks to improve learner success and by implication, their retention and graduation rates. In addition to daily reports, a series of consolidated reports are sent to key support services and faculties within the university (Jackson & Read 2012). Figure 2.9 gives an overview of a possible support process in C4S.



**Figure 2.9: Proposed reporting and intervention sequence in C4S**

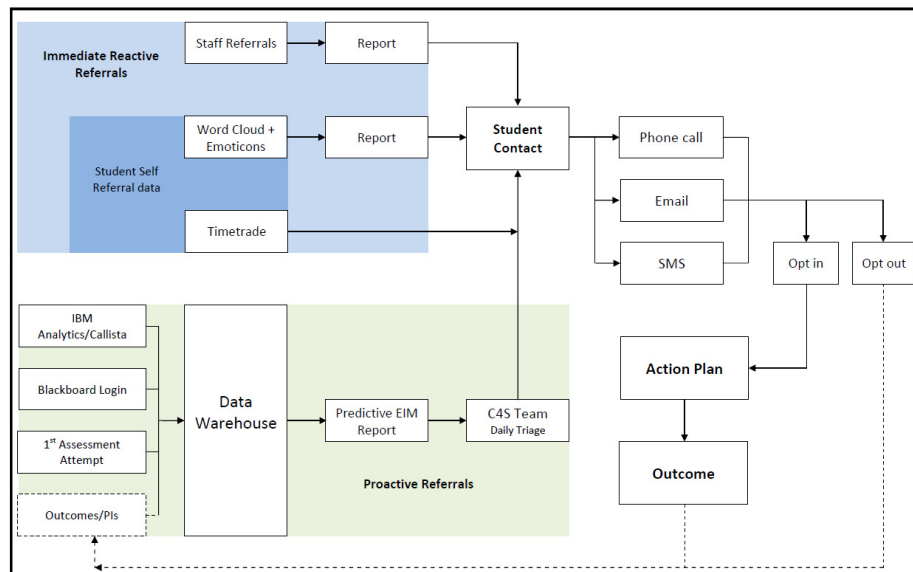
A co-ordinator/team leader from the student support centre (SSC) triage the list of students flagged. These students are then contacted by the Student Connect team either by telephone call, email, and/or SMS. Once contacted by the Student Connect

team, students are asked to ‘opt in’ for case management. If a student decides s/he would like support, a Student Connect team member contacts the student and drafts an ‘Action Plan’ customised to that student’s needs in collaboration with the student (Figure 2.10).

The screenshot displays the Edith Cowan University's C4S (Connect For Success) web application. The interface includes a sidebar with navigation links such as 'Case Search', 'My Followups', 'Assign Students', 'My Students', 'My Cases', and 'SOCAS Data'. The main content area is titled 'Contact Point Details' and shows information for a specific student (ID 727). It includes fields for 'Contact Method' (Phone), 'Contact Successful' (Yes), and 'Referred From' (Connect for Success Report). Below this, there are three rows of referral information, each with a 'Referred To' field and an 'Appointment' status (No Value). The 'Action Plan' tab is selected, showing the 'Connect For Success Action Plan' details. This section includes 'Case Details' (Name, ECU Student ID, Case Assigned To, Date Created, Semester Code, Course Title) and 'Details of agreed Action Plan' (Action Plan Created, Referred To, Appointment Date/Time, Followup Date, Action Plan Notes, Followup Complete).

**Figure 2.10: Edith Cowan University’s C4S**

Depending on what academic support a student wants, they may be referred to one or more of the support services within the university (Figure 2.11). Student Connect team members will work with the student until they report they no longer require assistance and referral services. The Student Connect team, work in close coordination with teaching staff, academic advisors, and support services people to make sure that students opt for the correct services.



**Figure 2.11: Flow chart of the process of early alert at ECU**

#### ***2.4.1.2.3 Queensland University of Technology (QUT), Queensland - The Student Success Program (SSP)***

The Student Success Program<sup>20</sup> (SSP) at QUT is a university-wide student engagement and retention initiative that focuses on the early identification of students who may be at-risk of disengaging from their studies (Figure 2.12). The SSP provides support to these students before they lose confidence, stop participating, fail assessment, or leave. The SSP provides proactive, purposeful advice, and referrals to these students. The SSP project aimed to provide in-course performance reporting and early intervention. For the in-course performance reporting, various indicators are used to identify disengaged students. The early intervention is a timely and promising phone call from a student, who is discipline-experienced and employed as a student success advisor to offer guidance.

<sup>20</sup> [http://safeguardingstudentlearning.net/wp-content/uploads/2012/04/LTU\\_Good-practice-guide\\_eBook\\_CaseStudy5\\_20130320.pdf](http://safeguardingstudentlearning.net/wp-content/uploads/2012/04/LTU_Good-practice-guide_eBook_CaseStudy5_20130320.pdf)



**Figure 2.12: The SSP organisational processes**

#### **2.4.1.2.4 Open University Australia (OUA) - Personalised Adaptive Study Success (PASS)**

In a Criterion Conference on ‘Improving Student Retention and Success’ held in Sydney on 27 June 2013, Dr Dirk Ifenthaler from OUA presented the PASS, an early alert tool designed and built to enhance student engagement and retention in an online learning environment. Based on individual characteristics, social web, curriculum, and physical data drawn from a number of systems (my study centre-study buddies, smart thinking-online study support, discussion forums, social media pages, student success hub, and others) in an online learning environment are integrated, processed, and analysed by a learning analytics engine, personalisation and adaption engine, and reporting engine, which helps to identify high-risk students who may be struggling or experiencing disengagement (Figure 2.13). Based on the various indicators used, the PASS generates visual signals, performance levels, self-assessment, predictive course mastery, highlights social

interaction, recommends content and activities and provides a personalised environment.

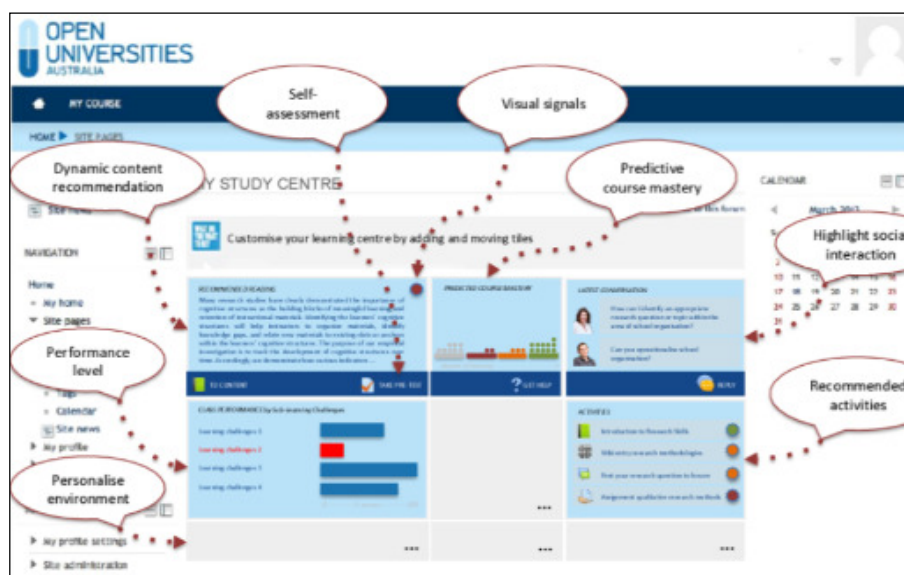


Figure 2.13: Open University Australia's PASS view

#### 2.4.1.2.5 University of New South Wales, NSW – Student Academic Risk (SAR) Report

The Student at Academic Risk report (SAR<sup>21</sup>) is a user-friendly and automated tool to track student achievement and academic risk. SAR was developed and trialled by the Australian School of Business (ASB) at UNSW in 2013-14. The report accesses important data from the university data warehouse (university systems such as SIS, LMS, and others). In the pilot, the ASB's student services team used to send approved warning emails to identified students. These emails encouraged students to get active in the unit and included links to support services. No further details of the tool was made available after the pilot.

#### 2.4.1.3 Other Case Studies – Commercial Providers

While differences exist in early alert systems, existing best practices state that successful systems identify the target audience specifically, define clear intervention processes, and create formal feedback systems (Lynch-Holmes, Troy & Ramos 2012). For this reason, many commercial products exist to help institutions establish early alert systems on their campuses. Some of the commercial products are Desire2Learn Student Success System™, Noel-Levitz Student Success

<sup>21</sup> <https://pdfs.semanticscholar.org/d307/34019734c219f6ab83af3dcebfa39c9e8b84.pdf>

Funnel™, DropGuard™, Early Alert Retention Software™, GradesFirst™, Insight Early Alert™, MAP-Works™, Starfish™ Early Alert System, Student Early Alert System™, Civitas Learning™, and Pharos360™. The process of early alert and intervention creates an efficient and effective network for referrers, responders, and students. Widening the safety net for students makes it harder for them to fall through the cracks thereby decreasing attrition rates by retaining students and improving student satisfaction (Kuh et al. 2011). A departure from Astin's (1993) early warning system ideas, commercial products have very large support networks, allowing students in need to receive assistance and timely information from individuals or campus support services (Seidman 2005; Swail 2004).

#### **2.4.1.4 Tool Comparison**

The review of tools was conducted early in the research process to provide an understanding of how early alerts were currently being implemented and to identify student and teacher experiences with them. As reported above, the literature provided information on the features, usefulness, or limitations of the tools. A summary of conceptual analysis of various exemplar tools along with MEAP is provided in Table 2.6. This conceptual analysis is based on the dimensions proposed by the Chatti et al. (2012) reference model for learning analytics. The four dimensions included are as follows:

- What? What kind of data the tool is using for analysis as *input* such as data from the learning management system, student information systems, library systems and social media pages?
- Who? Who is targeted by the analysis as *stakeholders* such as students, teacher, others. Stakeholders were discussed in section 2.3.3.3.
- Why? What is the purpose of the analysis as *goal/s*? Some of the possible goals of learning analytics include monitoring/analysis, prediction/intervention, personalisation/recommendation, adaptation, reflection, tutoring/mentoring.
- How? What methods/approaches/algorithms the tool uses for the analysis of the collected data as *techniques used* such as statistics, information visualisation, data mining, emotional intelligence and social network analysis.

**Table 2.6: Summary of Tools**

	International Case Studies					Australian Case Studies					
	Course Signals	Academic Referral System	GPS	E <sup>2</sup> Coach	OU Analyse	AWE	C4S	SSP	PASS	SAR Report	MEAP
Student Information System	X	X		X	X	X	X	X	X	X	X
LMS/VLE	X	X	X	X	X	X	X	X	X	X	X
Grade book	X	X	X	X	X	X	X	X	X	X	X
Attendance		X	X			X			X		
Discussion forums					X	X			X		
Social media pages						X			X		
Other data				X	X	X	X	X	X	X	
Learner	X	X	X	X	X	X	X	X	X	X	X
Teacher	X	X	X	X	X	X	X	X			X
Others*			X	X	X	X	X	X	X	X	
Prediction	X			X	X	X	X		X		
Intervention	X	X	X	X	X	X	X	X	X	X	X
Student self-reflection	X					X			X		
Student Success Algorithm	X				X						X
Statistics	X	X	X	X	X	X	X	X	X	X	X
Social network analysis						X			X		
Visualisation	X				X	X	X		X		
Emotional intelligence						X					

\* Other refer to support staff/retention team/academic advisors

These tools are likely to have undergone further enhancements since these publications. However, as this thesis is not focussed on evaluating an early alert tool or comparing it to other tools (MEAP is used to capture teacher and student perspectives), possible enhancements to the above mentioned tools since the original review have not been investigated.

## **2.5 Summary**

The subject of student engagement, retention, and graduation is a complex one. As noted by researchers such as Bradley and Blanco (2010), early intervention through a formal early alert system is an appropriate approach to deal with attrition at the unit-level. The motivation was that the usage of a student early alert system provides a shared environment for student institutional data in real time and the timeliness of intervention. Understanding the foundations and ground work of the above mentioned theories and models and the role they play within early intervention was relevant for this study. Different early alert systems from overseas universities, national universities, and commercial providers were discussed and compared. The intention was to expand our understanding of how the student data (performance or behaviour) is tracked to improve their engagement and academic success and not to evaluate existing early alert systems.

In our review of the learning analytics field, we found that no guidelines exist to show if the use of a particular model or framework demonstrate success with the tool/system. In the case studies reviewed for different models and frameworks, we found that the most critical challenge in the deployment of a learning analytics tool was the introduction of the tool itself across the higher education institution, stakeholder involvement and longer term adoption of a tool in a manner that results in behaviour change.

The sections 2.4.1.1-2.4.1.4 provide brief summaries of a selection of early alert systems/tools. We noted that each tool has different target groups such as students, teachers, academic advisors, support staff, university support services and department/faculty administrators. It is observed that all chosen early alert systems/tools had similar goals and all tried to achieve common purposes i.e. to identify students in need of support and intervention. We admit that the case studies included are not state-of-the-art tools and need further unpacking for their strengths

and weaknesses. Furthermore, possibly due to novelty or other reasons some HEIs do not make their tools/model available in research literature. Some universities are at the stage of small scale analytics projects that limit the generalisation of conclusions. Therefore, this research combined various engagement and retention theories to develop an improved theoretical framework. Additionally, it uses a prototype early alert system to conduct an impact evaluation. In this research, the descriptions of the theoretical framework and student ethical considerations are integrated into a comprehensive student survey which serves as a baseline for this work. The student survey is presented in chapter 4 and it was useful to evaluate the teachers' perspective regarding early alerts and the potential benefits and barriers to the early alert system usage with reference to an actual prototype system in chapter 5. The present study seeks to close the gap in the literature by developing a conceptual Student Engagement and Academic Success (SEAS) framework and validate it based on the empirical data.

The next chapter discuss the research design and methodology for this PhD thesis.

## **3 CHAPTER: RESEARCH DESIGN AND METHODOLOGY**

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### **3.1 Introduction**

This chapter discusses the research design and methodology to answer the research questions presented in chapter 1. In Section 3.2, we critically review the so-called research process *onion* by Saunders and Tosey (2012) including research philosophy; research methods; research strategies; time horizons; data collection techniques and procedures, emphasising the choice of a mixed methods approach. Section 3.3, describes the validity and reliability in mixed methods research. Sections 3.4 to 3.8 describe the research setting and sample population as this PhD research examined the perceptions of students' and teachers' about early alerts usage at Macquarie University.

### **3.2 The Research Design**

Given the nature of this research, it was important to select and use a suitable research approach that is well structured and elaborative. Therefore, a generic research onion process (GROP) by Saunders et al. (2012) was adopted (Figure 3.1). A set of concentric circles are used to illustrate the GROP. When seen from the outside, each layer of the research onion defines a more comprehensive stage of the research process which helps to understand the different methods of data collection. The following sections include the description of how these research layers were applied/adopted in this research work.

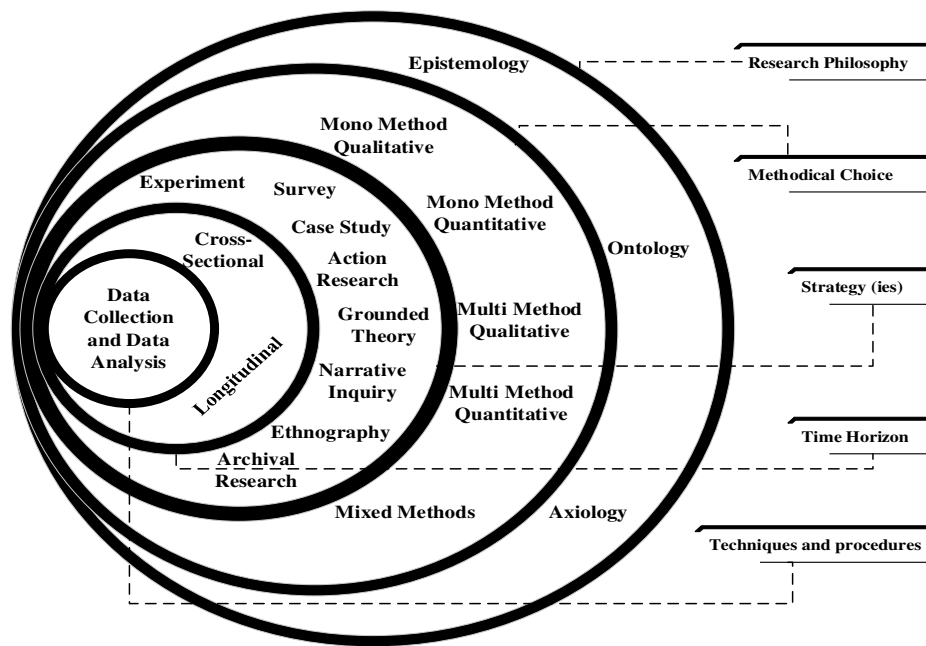


Figure 3.1: Generic Research Process Onion. Adopted by Saunders et al. (2012)

### 3.2.1 Research Philosophy - Epistemology

The school of thought regarding research philosophy followed in this PhD thesis is the ‘epistemology’. The Stanford Encyclopaedia of Philosophy defines epistemology as, “the study of knowledge and justified belief” (<https://plato.stanford.edu/entries/epistemology/>). Epistemology is characterised by perspectives such as *positivism* (also called scientific approach), *realism*, *interpretivism* (also known as constructivism) and *pragmatism*.

The theoretical research framework (chapter 1, section 1.4) is a basic belief system, concept or theory that guides what and how we gain knowledge. We attempt to pursue the ‘positivism’ and ‘interpretivism’ philosophies since the research area is a complex business environment (a higher education institute) and the objective of the research is to investigate the individual’s (students and teachers) perceptions, attitudes and opinions regarding early alerts in that complex business context (to identify at-risk students). Considering that the research situation is unique, including specific individual opinions and characteristics, unit design and particular decision making criteria, the results may not be suitable for generalisation to other higher education institutions. However, the evaluation of this research work may involve generalisability of the results to units with similar unit design (assessment criteria) and faculties with student intake by similar characteristics.

### 3.2.2 Methodical Choice - Mixed Methods

This layer of the research onion comprises basic choices researchers have to make while designing their research. It includes mono method qualitative, mono method quantitative, multi-method qualitative, multi-method quantitative and mixed methods. Researchers can choose either of these methods for data collection and corresponding analysis procedure. In *mono methods*, a researcher can use only a single data collection technique with corresponding analysis procedure. In *multi-methods*, a researcher can use more than one data collection technique with associated statistical analysis procedures. In *mixed methods*, a researcher can combine both qualitative and quantitative data collection techniques (in any order) and analysis procedures.

Mixed methods research has been named as the third research paradigm where quantitative and qualitative research methods are combined into a single study (Newman 2008; Teddlie & Tashakkori 2009). Historically, quantitative (positivist) and qualitative (interpretivist) research paradigms have been viewed as distinct and incompatible approaches to research (Howe 1988). A mixed methods design was deemed superior to the use of a single method for this research because of the following reasons: (1) the topic under investigation (students and teachers perspectives of early alerts) was relatively unexplored; and (2) it can balance the strengths and weaknesses of qualitative and quantitative methods and suggest greater understanding of the problem domain (Creswell 2013; Leech & Onwuegbuzie 2009). However, mixed methods research has attracted criticism where researchers have failed to clearly articulate the purpose for choosing a mixed method design (Bazeley 2009). These purposes include complementarity, completeness, developmental, expansion, corroboration/confirmation, compensation and diversity (Venkatesh, Brown & Bala 2013).

There are several types of mixed method designs which can be distinguished by a) implementation of data collection and b) priority (Morse 2003; Teddlie & Tashakkori 2009). ***Implementation of data collection*** refers to the sequence in which both quantitative and qualitative data are collected. Data can be gathered concurrently or in phases such as triangulation, embedded, explanatory, and exploratory (Creswell & Clark 2007). *Triangulation mixed methods* design allows the researcher to combine qualitative and quantitative data to understand a research

problem. *Embedded mixed methods* design uses either qualitative or quantitative data to answer a research question within a largely quantitative or qualitative study. *Explanatory mixed methods* design uses qualitative data to help demonstrate quantitative results. *Exploratory mixed methods* design collects quantitative data to evaluate and illustrate a relationship found in qualitative data. **Priority** refers to the emphasis that researchers give to qualitative and quantitative research. There can be equal priority to methods or one part can be emphasised more than another. Equivalent status designs relate to studies where quantitative and qualitative approaches are used equally to understand the phenomenon.

The development of new and complex information systems (such as student early alert systems) brings in challenges for the organisations related to system competencies, usage, adoption, and acceptance. For this research, I wanted to understand the perceptions, attitudes and opinions of both students and teachers towards early alerts and interventions. Given the research questions, purpose and context of this research, *mixed methods* was most suited to use for addressing the research aims of this thesis. The main purpose for conducting mixed methods approach was ‘triangulation’ with an ‘equal priority’ to data collection. The guidelines and recommendations suggested by Venkatesh et al. (2013) are used for conducting and evaluating this mixed methods research.

### **3.2.3 Research Strategy - Exploratory Case Study**

According to Saunders and Tosey (2012), the choice of a research strategy (ies) depends upon the research question/s posed and the research objectives. Whether research is exploratory and/or descriptive, there are eight adaptable strategies to use when collecting and analysing empirical data such as: survey, experiment, action research, archival research, grounded theory, narrative inquiry, ethnography and case study. According to Yin (2013), no research strategy is considered superior to the other and each has its advantages and disadvantages. The appropriateness of each of these research strategies is dependent upon (a) “the types of research questions posed”; (b) “the degree of control the investigator has over the behavioural events”; and (c) “the degree of focus on contemporary as opposed to historical events” (Yin 2013, p. 5). The justification for the research strategy adopted for this PhD thesis is as following.

In regards to (a), Yin (2013, p. 5) classifies research questions into three main categories: ‘explanatory’, ‘descriptive’ and ‘exploratory’. For example, when research questions focus on ‘how’ and ‘why’ questions then the preferred methodology is *explanatory* research; ‘who’ and ‘where’ questions are used for *descriptive* research; and ‘what’ questions for *exploratory* research. The two leading research questions postulated in the current study are ‘what’ questions, i.e., ‘what are the opinions, attitudes and preferences of students with respect to early alerts’ and ‘what are the perceptions, experiences and motivations of teachers with regard to usage, helpfulness and barriers to the use of early alert systems’? Following from Yin (2013) an ‘exploratory approach’ is the chosen research strategy for this thesis. A comprehensive study of the students’ and teachers’ viewpoints in the context of attitudes and opinions towards early alerts and actual use of an early alert system to improve student engagement has not been undertaken. Therefore, the implementation of an exploratory approach is well justified for this research.

In regards to (b), the ‘case study’ is the preferred research strategy for the current study. In this study, gathering the perceptions of students and teachers regarding early alerts was undertaken in the context of an early alert system. The investigator had no control over whether students received alerts or how they responded to them. Also, the investigator had little control over whether teachers used the early alert system or to what extent. Consequently, due to the lack of investigator control over these behavioural events the case study is the preferred research option (Yin 2013).

Furthermore, Yin (2013) argues that the case study could be a preferred research methodology when the phenomenon (research topic) and the context cannot be clearly distinguished. Context is highly important in this thesis because learning analytics practitioners and researchers apply the term ‘at-risk’ to a number of alternative scenarios (Campbell, DeBlois & Oblinger 2007), including early attrition (Agnihotri & Ott 2014), retention but failure (Brown & Evagelistis 2011), or retention but unsatisfactory performance (Jayaprakash et al. 2014). The scenario of focus in the current study was students’ and teachers’ perspectives on early alert system usage to determine and improve student engagement and performance at the unit-level. In the Australian context, a number of HEIs (including Macquarie University) have started to use learning analytics to help students and teachers

understand and optimise learning. Hence, an ‘exploratory case study’ was conducted on the students and teachers of our institution.

### **3.2.4 Time Horizon – Cross-Sectional**

Typically when planning a research project, there are two categories of time horizons to decide on such as cross-sectional or longitudinal. The *cross-sectional time horizon* is often mentioned as a *snapshot* because the research is completed at a particular point in time (Saunders, Lewis & Thornhill 2012). This time horizon is commonly used for research projects that collect data on several variables (such as demographics, attitudes, behaviours, intentions) using a case study or survey and have a time limit (Saunders & Tosey 2012). The *longitudinal time horizon* is also known as the *diary* (Saunders, Lewis & Thornhill 2012). This time horizon is generally used for research projects which observe people (behaviours), events or any change and development over a period of time using strategies such as an experiment, action research, grounded theory, and archival research (Saunders & Tosey 2012).

The time horizon applied in this research is the ‘cross-sectional’, and even though it has taken place over a period of a number of years (December 2013 - November 2015) it represents multiple ‘snapshots’ in time to determine the prevalence of students attitudes and opinions regarding early alerts. The units selected to run the survey from the student perspective study in every semester were different. We learn from the literature that most research projects undertaken for academic units/courses are time constrained (Creswell 2013). During the data collection time period, students were asked if they wanted the alerts and when and how they wanted the alerts, and in almost all units, interventions were done but the respective students who got the alerts were not carried forward to the next semester to observe their engagement with their studies. This carry forward was not possible because some of the students did not receive an alert at all or some received an alert in one unit and not in others.

### **3.2.5 Research Techniques and Procedures**

The research was undertaken in the form of two studies: for purposes of simplification, the first will be called ‘student perspective’ study, and the second will be called ‘teacher perspective’ study.

The purpose of the ‘student perspective’ study was to investigate the opinions and preferences of students with respect to early alerts. It explored their attitudes towards the interventions (including the types and quality of communication with the teaching staff) based on data collected from student surveys.

The ‘teacher perspective’ study explored the perspectives of teachers regarding early alerts and the benefits and challenges of a prototype system (MEAP) using institutional LMS (iLearn) data to improve the engagement and academic success of students within a unit. It occurred in two stages. The first stage (Teacher Perspective Study-A) involved a qualitative analysis of data collected from teachers (N=9) through individual interviews. The second stage (Teacher Perspective Study-B) was predominately quantitative, involving the development and distribution of a survey to a comparatively larger group (N=16) of teachers. The Teacher Perspective Study-B survey questions and responses were designed based on the interview data from the Teacher Perspective Study-A. The purpose of the survey was to reduce the need for interpretation of qualitative data and thereby validate the findings from the interviews while also increasing the sample size.

Data was collected and analysed separately in both studies (Student Perspective and Teacher Perspective study). Then, results from both studies were compared and interpreted. Figure 3.2 depicts the overall research design of this research. Further detail on the research method and analysis is provided in the methodology section of each study respectively (Chapters 4 and 5).

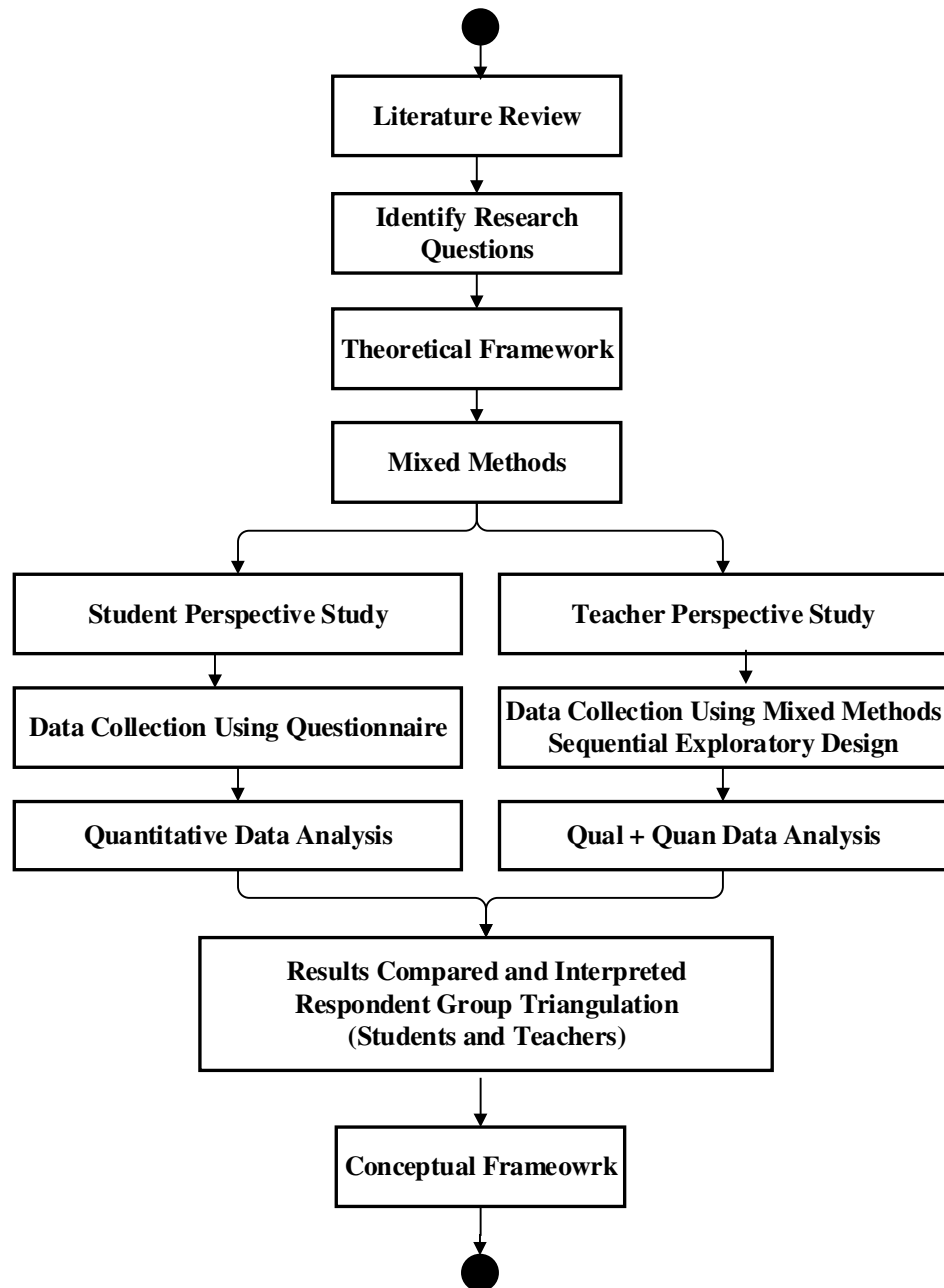


Figure 3.2: The Research Process

### **3.3 Mixed Methods Research – Validity and Reliability**

This PhD research uses mixed methods. For a consistent assessment of our research method, we use the terms ‘validity’ and ‘reliability’ throughout. It is essential to note that the validity and reliability measures considered for both the ‘student perspective’ study and ‘teacher perspective’ study are different. The reason being both studies required different data collection and analysis processes. Validity and reliability of both studies are discussed separately in the following chapters 4 and 5. Our use of validity and reliability measures are consistent with the classification of mixed methods validity and reliability suggested by Venkatesh et al. (2012).

### **3.4 The Research Site**

As presented in Chapter 1, the location of this study was Macquarie University, a large metropolitan public university established in 1964 on the east coast of Australia in Sydney. Figure 3.3 provides key vital statistics. Spanning 126 hectares, with open green space designed to give the Macquarie community the ‘freedom to think and grow’. Macquarie University is known to be the first in Australia to fully align its degree system with the Bologna Accord (<http://www.smh.com.au/nsw/honours-to-go-at-macquarie-20111102-1mvqi.html>). The institutions’ research is viewed as bold and innovative, to research, and renowned for its courses and degrees in education, accounting and finance, earth and marine sciences, engineering, and health-related ventures. Continuing its early mission of prosperity through service to the region, Macquarie University’s main goal is to produce quality graduates who are prepared to lead, which is directly mentioned in the University’s annual report (Macquarie University 2015).



**Figure 3.3: A Snapshot of Macquarie University**

### **3.5 Organisational Context of the Macquarie University**

Macquarie University is administered by a Council of 17-members (Figure 3.4). The following description of the Macquarie University is taken from Macquarie University Annual Report (Macquarie University 2015).

The University Council is the governing authority of the university under the Macquarie University Act 1989. The Council takes primary responsibility for the control and management of the affairs of the University, and is empowered to make by-laws and rules relating to how the University is managed. Members of the Council include the University Vice-Chancellor, Academic and non-academic staff, the Vice President of the Academic Senate and a student representative. The Council is chaired by The Chancellor of the University. The Academic Senate is the primary academic body of the university. It has certain powers delegated to it by Council, such as the approving of examination results and the completion of requirements for the award of degrees. At the same time, it makes recommendations to the Council concerning all changes to degree rules, and all proposals for new awards. While the Academic Senate is an independent body, it is required to make recommendations to the university Council in relation to matters outside its delegated authority.

The university currently consists of 35 departments within five faculties. The faculties are: Faculty of Arts, Faculty of Business and Economics, Faculty of Human Sciences, Faculty of Science and Engineering and Faculty of Medicine and Health Sciences. The university has its own Macquarie Hospital, the Macquarie Graduate School of Management, the Australian Research Institute for Environment and Sustainability and the Australian Hearing Hub.

For the duration of most of this project, there were only four faculties, the faculty of medicine and health sciences was formed in 2014 after we had commenced student and teacher perspective data collection and thus has little representation.

# Macquarie University organisation chart

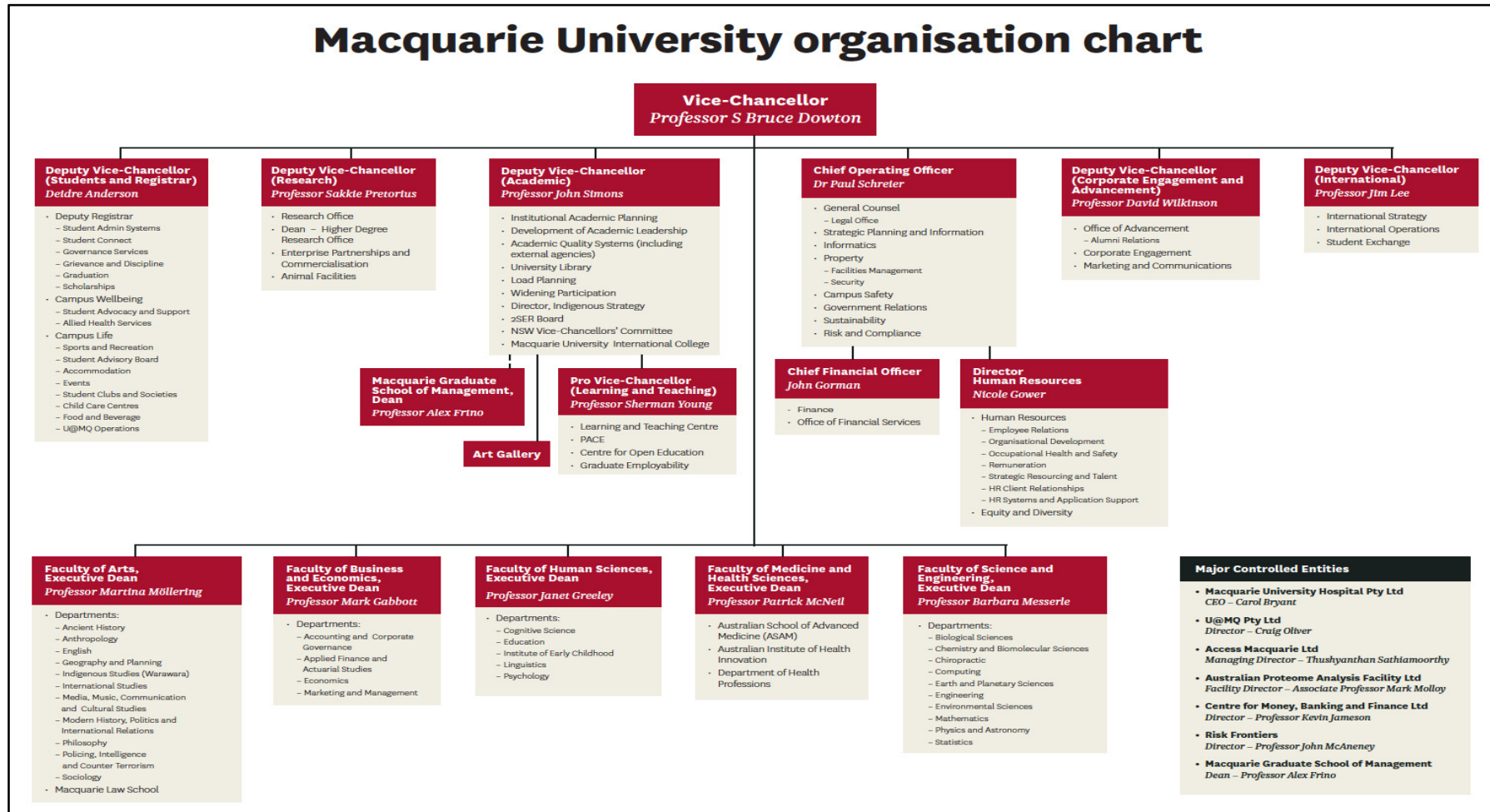


Figure 3.4: Organisational Chart

## 3.6 IT Systems Used at Macquarie University

At Macquarie University, we have large datasets about learners, their learning, and the environments in which they study. These vast amounts of data are stored in different IT systems such as student information systems, learning management system and in various databases such as admissions files, library records and other systems such as social media tools. These large volumes and the increasing complexity of different kinds of data sitting in different computational environments make it hard to collate them for analysis. To deal with these complex and large volumes of data, this research explores the use of learning analytics at Macquarie University to improve student retention and experience in blended courses. Figure 3.5 provides an overview of the different IT systems used at Macquarie University. In the following sections an overview of these systems is provided.

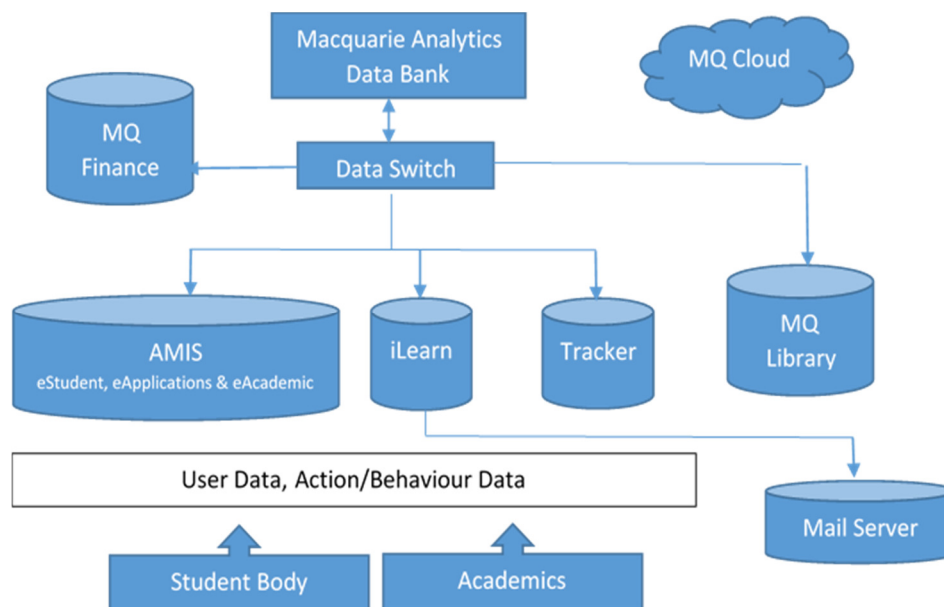


Figure 3.5: Macquarie University IT Systems

### 3.6.1 AMIS (The Student Information System)

The AMIS is an Academic Management Information System. The AMIS relates to eStudent (for students), eApplications (enrolment data) and eAcademic (for academics). The AMIS contains the data Macquarie University collects from its students throughout their student life cycle. The objective is to assist students, provide information about specific units to them or to understand what they are enquiring from the institution. *eApplications* contains all the enrolment data for new

students at Macquarie. *eAcademic* helps teachers to find their daily class registration lists, class locations, unit enrolment lists, student GPAs, student contact details, student timetables, and student transcripts. *eStudent* is the web interface to student administration at Macquarie. Students can update their contact information, see their offerings, enrolment and timetable, transcripts, and complete their Commonwealth Assistance Form (eCAF) for FEE-HELP.

### **3.6.2 Tracker (CRM)**

Tracker is a student enquiry management system. At Macquarie, Tracker supports the educational and administrative activities of the University and serves as one means of tracking relationships between students, staff, and external parties. The Tracker provides students access to information across all student administration processes such as grade appeals, special approvals (waivers), and disruptions. Students know Tracker as 'ask.mq'. Students are able to search the extensive questions and answers library that sits within Tracker or submit an online enquiry that will go to the appropriate team (Student Connect or Faculty Student Centre) to respond to.

### **3.6.3 The Moodle iLearn (online LMS)**

The iLearn is Macquarie's online Moodle-based learning management system. It provides an online environment for learning, teaching, communication, and collaboration. iLearn includes a number of different interconnected elements (Table 3.1).

**Table 3.1: Macquarie University's Moodle LMS (iLearn)**

<b>Element</b>	<b>Description</b>
iLearn	iLearn can be used to make lecture notes, readings, quizzes, discussion forums and other learning resources and activities available to students online.
iTeach	iTeach is the Macquarie's online system to create unit guides and activate iLearn spaces. Unit Convenors use the system to write their unit guides and map the unit against Macquarie's graduate capabilities. Unit Convenors can activate their iLearn space for each study period by creating a blank iLearn space or copying the space from a previous offering. Staff and student access can also be set and cohorts enrolled into an iLearn space through iTeach.
Echo 360	Echo 360 is the system that enables lectures to be recorded and made available to students online through iLearn.
Turnitin and GradeMark	Turnitin is an online text-matching software that compares electronically submitted papers to databases of academic publications and other student papers. GradeMark is a product within Turnitin that facilitates marking and feedback for assignments online.
iShare	iShare (based on a product called Equella) is a digital repository system.
Zoom	Zoom is Macquarie's web conferencing tool which provides video and voice communication, text chat, interactive whiteboard, screen sharing and annotation. Zoom offers a wide variety of opportunities for learning and teaching such as real-time online tutorials, virtual consultations with students or including an external guest speaker in a lecture.

The description of these interconnected elements are taken from Macquarie intranet page at 'ilearn.mq.edu.au'.

### **3.7 Early Alert System Usage at Macquarie University**

At the commencement of this PhD project no early alert system existed at Macquarie University. Given the potential benefits and this gap, this thesis was motivated to explore student and teacher attitudes to an early alert system and several student surveys were conducted for this purpose. As introduced in Chapter 1, this thesis work led to submission of a Teaching Delivery Grant proposal at the

end of 2014 that resulted in the development of the first institutional early alert system at Macquarie University in 2015, as described next.

The Moodle Engagement Analytics Plugin (MEAP: [https://moodle.org/plugins/view/report\\_engagement](https://moodle.org/plugins/view/report_engagement); released under the GNU General Public Licence), originally developed by Phillip Dawson, Adam Olley, and Ashley Holman is an early warning system that monitors students' academic performance. It provides unit convenor with a configurable set of risk indicators that can be used to assess student engagement in a unit. The original MEAP uses three indicators, which analyse students' login activity, assessment submission activity, and forum viewing and posting activity to produce a total risk rating (Figure 3.6).

Username	Assessment Activity	Forum Activity	Login Activity	Total
	0% (6%)	30% (100%)	9% (12%)	39%
	0% (11%)	30% (100%)	21% (30%)	51%
	0% (6%)	30% (100%)	22% (31%)	52%
	0% (6%)	30% (100%)	23% (33%)	53%

**Figure 3.6: Screenshot of original MEAP interface**

The MEAP provides a quick 'traffic light' snapshot view of the students in a particular course based on a configurable risk calculation. It also links through to a report on all students in a course, as well as a detailed explanation of how risk is calculated for a particular student. The built-in indicators of engagement in MEAP were:

- Login activity: how often, how recently, and how long are students logging in?
- Forum activity: are students reading, posting, and replying?
- Assessment activity: are students submitting their assessed work, and are they submitting on time?

Being part of the Teaching Delivery grant project, we had discussions among senior management from Learning and Technology, Learning and Teaching, Heads of Departments, Educational Development Group members and Student Support officers to use MEAP at Macquarie with targeted units in 2015 to improve student retention and the student learning experience. We used historical data from three introductory (first-year) undergraduate units to validate MEAP using student final grade as a proxy for student performance to identify students that are at risk of not

completing their unit. Initial validation using historical data found that from about week 4 in the session, students' online behaviour and activities as measured by MEAP were strongly correlated to their final grade (Liu et al. 2015b). A design-based research approach was then used, where we examined the experience of students and teachers with MEAP, together with its impact on student retention and learning. The attitudes and preferences towards early alert systems of unit convenors, support staff and students were gathered and analysed in sessions 1 and 2, 2015 to identify needs, barriers, and usefulness of an early alert system and to examine the impact of receiving emails on student motivations and experiences and their learning behaviours and outcomes (Atif, Bilgin & Richards 2015). The results were used to iteratively design and validate MEAP. In session 1 2015, the team enhanced and extended MEAP following pilot studies with MEAP in 13 units with 4800 students. This added a new indicator (Gradebook) and an additional assessment type (Turnitin) (Liu et al. 2015a). This new version was called MEAP+. The Gradebook contains the marks awarded to the student for each assessment task. Turnitin assignments are a type of assessment task where the submission is processed by plagiarism software (see Table 3.1). The addition of these two triggers improved the tools ability to identify students at risk of not completing their unit. Ignoring Turnitin assignments and student marks in the Gradebook was a shortcoming of the original MEAP implementation. By addressing this shortcoming, for units that have Turnitin assignments, MEAP+ will be able to use this data to determine students' success relating to those assignments. Similarly, MEAP+ will provide a more accurate picture of the students' performance in units that use the gradebook (we expect all units to fall into this category), than MEAP that did not take the gradebook marks into account. The team also extended MEAP's functionality so that once the unit convenor had identified students, they could be contacted directly via email from MEAP+. The team streamlined the workflow around sending emails and also included a bank of messages that the convenor could select and customise to improve consistency and efficiency.

Within the context of the Teaching Delivery Grant project as a researcher in the team, I did a literature review related to student engagement, learning analytics in higher education and student early alert systems. I looked at various learning analytic tools available at Australian and International universities as case studies

to enhance our understanding on how teachers can make use of data in their units to monitor and predict student performance. I designed and developed student questionnaire and contributed in the design and development of teacher and support staff interview questions based on the existing literature on the use of early alert systems. I also helped to conduct student surveys, convenor, and student support officer interviews to determine the expectations, motivations, and impact on behaviour of learning analytics on teaching and learning. Furthermore, I did programming (SQL and PHP coding) for the Turnitin to be included in the assessment indicator in MEAP+. I did quantitative data analysis of the student surveys (using SPSS) and thematic analysis of the teacher interviews (using NVivo).

The following chapters (4 and 5) provide the details of the surveys and interviews and the results and implications for Macquarie University and other higher education institutions.

### **3.8 Identifying Data at Macquarie University Related to Student Success Factors**

Drawing on the factors that are critical to student success and retention identified from the literature in the previous chapter (such as Table 2.2 and section 2.2.5), Table 3.2 presents a summary of pertinent data held in some of the Macquarie University systems described above or captured in our studies. It is important to note here that the factors described in Table 3.2 are only captured in ‘student perspective study’. Furthermore, none of these factors are captured in the Macquarie Library system (not shown in Table 3.2 for space restrictions).

**Table 3.2: Factors critical to student engagement and success at Macquarie University (MQ)**

Factors	Captured in Student Study	AMIS			Tracker	iLearn (via Email)	MQ Finance	Social Media	Teacher Access
		eStudent	eApplications	eAcademic					
Background Characteristics									
Age **	X	X	X	X					F
Gender **	X		X						F
Socio Economic Status (SES)		X	X						L
Ethnicity **	X	X	X						L
First Language	X	X	X						L
Parental Education			X						L
First in the Family			X						L
Family Responsibility **	X				X				L
Academic Performance									
AUS Tertiary Admission Rank (ATAR)		X	X	X					F
Study Mode	X	X	X	X	X	X	X		F
Enrolment Status **	X	X	X	X	X	X	X		F
Overall GPA		X	X	X					F
Attitudes and Satisfaction									
Academic self-discipline	X								N
Attitude towards learning	X								N
Commitment	X								N
Financial/Economical									
Work full-time **	X								N
Work part-time **	X								N
Financial issues-other	X		X				X		N
Health									
Mental health **	X		X		X				L
Emotional health **	X		X		X				L
Physical disability **	X		X		X				L

Factors	Captured in Student Study	AMIS			Tracker	iLearn	MQ Finance	Social Media	Teacher Access
		eStudent	eApplications	eAcademic					
Read Unit Guide	X					X			F
Understand unit requirements	X					X			F
Skills/abilities to undertake the unit **	X					X*			F*
Learning motivation in the unit	X								N
Attitudes, Engagements, Expectations and Satisfaction									
Attitude towards learning	X								N
Attitude towards being contacted **	X								N
Attitude how student view their teacher	X								N
Attitude towards unit related support **	X								N
Attitude towards student data access **	X								N
Emotional engagement to teachers & peers **	X								N
Behavioural engagement to intervention **	X								N
Student academic support **	X				X				L
Helpfulness of student support services **	X								
Problems with daily travel	X								N
Social connectedness	X							X	N
Religious commitment or activities **	X								N
Social coping skills/social life style	X							X	N
Social support	X								N
Support from family	X								N

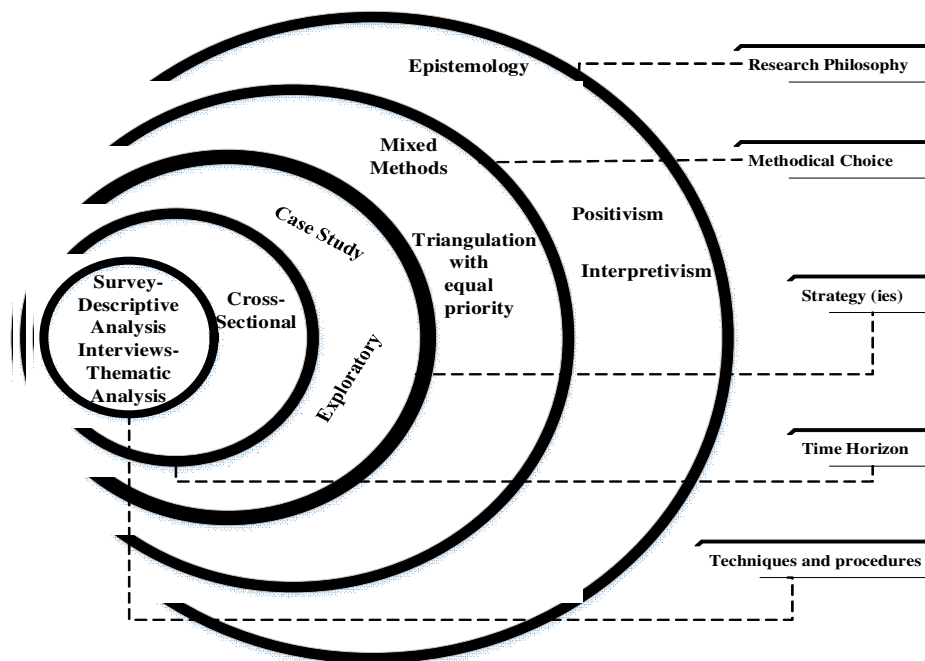
Entries with \* shows the students other than First Year and First Semester (FYFS)

Entries with \*\* shows the items relating to the theoretical framework (Section 2.2.5-Table 2.2)

In Teacher Access column, the abbreviations are represented as: Full Access-F, Limited Access-L and No Access-N

### 3.9 Summary

This chapter presented the research methodology used for investigating (1) the attitudes, opinions, and preferences of students with respect to early alerts and (2) the perspectives of teachers regarding early alerts and their experiences and motivations with regard to usefulness and barriers to the use of early alert system. The study was *positivist* and *interpretative* and used the *mixed methods as an explorative case study*. Also, the study was *cross-sectional* as it represents ‘snapshot’ in time to determine the prevalence of students’ attitudes and opinions regarding early alerts. Figure 3.7 summarises the research philosophy, method, strategy, and data collection and analysis techniques for this research. The Figure 3.7 is a modified version of Figure 3.1 to reflect the research process used for this research.



**Figure 3.7: Extended Generic Research Process Onion used in this research**

The next chapters discuss the student perspective (chapter 4), teacher perspective (chapter 5) and the complete analysis of the data collected in the respective studies.

## 4 CHAPTER: THE STUDENT PERSPECTIVE STUDY

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### 4.1 Introduction

Online learning comes with a challenge to teachers and institutions to manage student learning and measure the engagement of large numbers of students with the aim of retaining more students and improving student engagement and academic success rates. The literature documents that there is a lot of attention given to educational data mining (algorithms) for the prediction of students' performance; ethics and privacy of using student data; and the potential benefits of early alert systems. However, an extensive study of the students' and teachers' perspective in the context of attitudes and opinions towards early alerts based on the actual use of an early alert system to improve student engagement has not been undertaken. This chapter provides a discussion of students' perceptions of early alerts and analysis of the student data.

The purpose of this quantitative study (Student Perspective) was to understand the opinions and preferences of students on their attitudes towards the interventions (i.e. early alerts); how to best contact them; their academic issues; type(s) and quality of communication with the teaching staff; and types of university services required and received. The following research questions regarding aim 1.5.1 are addressed in this chapter:

- What are the opinions and preferences of students with respect to early alerts?
- What is the attitude of students receiving an early alert/intervention?
- Do students report change in behaviour for how they studied for a unit, if they actually receive an early alert?
- Do early alerts increase student performance and motivation to continue in the unit?
- Do early alert notifications increase student motivation to utilise the campus student support services?

The following section describes the 'student perspective' study design. The student perspective was investigated over a two-year period from December, 2013-15 via

a pilot study, and four follow up studies. The timeline of the pilot and the four case studies are discussed in the following section 4.2. The design of the student perspective study is presented in section 4.3. Each case study, from the pilot to the final study (case study 4) are presented from section 4.4 to 4.8, respectively. The answers to the student related research questions, as listed in this section, are discussed in section 4.9, followed by chapter summary and conclusions in section 4.10.

## **4.2 Case Studies: An Overview**

Given the exploratory nature of this research and the novelty of the early alert system at our institution, four case studies were carried out including the final study. Yin (2013) highlighted the significance of a case study to investigate a topic in-detail and in its general setting/environment. Literature shows that the use of single case study is practically feasible, however, the multiple case study approach is supposed to be more suitable to the study of typical cases of information system implementations. Multiple cases are suggested to increase the methodological rigor of the study through “strengthening the precision, the validity and stability of the findings” (Miles, Huberman & Saldana 2013, p. 29), particularly, because “evidence from multiple cases is often considered more compelling” (Yin 2013, p. 45).

Our four case studies help us unpack and understand the challenges associated with students’ attitudes and behaviour after receiving an early alert/intervention. The timeline of the case studies, as well as their aims, number of units involved for the studies and participants are illustrated in Table 4.1. In the respective case study sections (section 4.4-4.8), we have also added failure rates for the units within our department as we have access to those numbers but not to failure rates in units outside our department. Some comparison of failure rates in previous offerings of a unit, before MEAP was used, was made during the study. However, given differences between unit designs, delivery methods and assessments, we could not draw any conclusions and thus do not report this analysis. We note that in many cases, participating convenors were already providing interventions/alerts to their students through manual means, also making comparison difficult.

As shown in Table 4.1, the data was collected over two years, December 2013-15. To anonymise the units, the real unit codes are not used for reporting. The alphanumeric unit codes presented in this thesis shows the discipline (the first four letters) in which the unit is offered followed by the digit which show the level of unit (100-level or 200-level). The group of target respondents and units in these case studies were different. The rationale, aims, and methodology were similar to those of the final empirical study, albeit with smaller sample sizes.

Yin and Creswell are of the view point that when a study involves more than one case, the strategy for case selection (as a final study) changes because the motivation changes from that being the purpose of the study to the issue of external validation and generalisability of the findings (Creswell 2013, pp. 158-159; Yin 2013, p. 35). Case studies, in contrast to other strategies (surveys and experiments) depend on ‘analytical’ rather than ‘statistical’ generalisation. It is important to clarify the difference of the two generalisations here to understand the selection of the final case study for this PhD research. Typically, statistical generalisation is attained when results from a correct sample are generalised to a bigger population and analytical generalisation is the generalisation of “a particular set of results to some broader theory” (Yin 2013, p. 36).

We chose case study 4 as our ‘final study’ because of the bigger sample size as more units were on board representing the four faculties and above all, the availability of the most advanced version of semi-automated prototype system (MEAP+). In addition, we also included more questions regarding if students received an early alert, and if so whether early alerts increased student performance and motivation to continue in the unit and finally how, if ever, students change their behaviour for how they study for a unit. The timeline of case studies in Table 4.1 shows that each case study played an important role moving from a single department to across other faculties in the institution. Section 4.9 presents a student perspective discussion of the case studies highlighting the results from the final study (case study 4). The detailed results of pilot and case studies 1-3 are provided in sections 4.4-4.7 and a comparison table of the case studies 1-4 including the pilot is presented in Appendix F.

The following subsections present a selection of key results from the pilot study and document the process and thinking that led to the final study (case study 4).

**Table 4.1: Timeline and Overview of Pilot and Case Studies**

Study Name	Time Period	Description	# of Units	Unit-Participants
Pilot	Session 3 (Dec 2013-Jan 2014)	Specific Purpose: Test the initial survey. Initial and Follow-up surveys sent. Alerts were sent under a pseudonym 'computing study buddy'.	1	ISYS1XX-39 students
Case Study 1	Session 1 (Mar 2014-Jul 2014)	Specific Purpose: Validation of revised survey and data capture from more than one unit. Identify at-risk students according to the triggers specified by the unit convenors and send interventions to identified students. Initial and Follow-up surveys sent. Alerts were sent under a pseudonym 'computing study buddy'.	2	ISYS1XX-367 students COMP1XX-64 students
Case Study 2	Session 1 (May 2014-Jul 2014)	Specific Purpose: To widen the distribution of the survey, specifically targeting high-risk units in the Faculty of Science and Engineering (FoSE). Study was requested by the FoSE Academic Standards and Quality Committee to determine value of early alerts in future offerings of the units. Only the Initial survey was sent at the end of the semester. No interventions were done.	3	All students (810) enrolled in units COMP1XX, MATH1XX and PHYS1XX
Case Study 3	Session 1 (Mar 2015-Jun 2015)	Specific Purpose: Institution-wide distribution of the survey and utilisation of MEAP in units that met the unit participation criteria (i.e. large enrolments, online activities in iLearn and high failure rates in the last study period). To use and test the Moodle Engagement Analytics Plugin to generate an engagement report to identify the students at-risk. Note: students were identified as 'at-risk' via MEAP+. Alerts were sent within the LMS to student email addresses and were sent from the unit convenors email address. Initial and Follow-up surveys were sent.	13	4,800 students enrolled in 13 participating units
Case Study 4 (Final Study)	Session 2 (Aug 2015-Nov 2015)	Specific Purpose: Institution-wide distribution of the survey and utilisation of MEAP+ in units that met the unit participation criteria. To test the extended version of the MEAP+ prototype to identify students at-risk and send alerts and interventions to students using the mailer component. To increase the response rates to our online survey an incentive (prize draw) was added to facilitate survey recruitment and motivate participants who might otherwise not respond. A single survey combining Initial and Follow-up questions was sent at the end of the semester.	17	7,035 students enrolled in 17 participating units

## **4.3 Student Perspective Study Design**

The design of the student perspective study was exploratory and descriptive. During December 2013-15, data was collected with an online questionnaire in four case studies covering multiple units. To answer the research questions related to this quantitative study, the author developed a survey instrument (questionnaire) for data collection. According to Sekaran (2006, p. 67), “questionnaires are a well-organised and efficient method for obtaining data when little prior research has been conducted on a phenomenon”. The literature on student success and retention was used to identify the pertinent questions and measurements. The participants, data collection, and instrument reliability and validity are discussed in the following sections.

### **4.3.1 Participants**

The participants for the student perspective study were students enrolled in undergraduate units, delivered in either an online or blended mode at our institution during the academic years 2013-15. The process for recruiting participants for each case study was as follows. Firstly, we identified the units with large enrolments, online activities in iLearn and high failure rates in the past three offerings with the belief that students in such units could benefit from early alerts. Then, we approached the unit convenors for their approval. If the unit convenor agreed, we invited each student to be a participant to the study. Therefore, instead of sampling students within the units, we gave each student an opportunity to participate. The characteristics of the participating students, criteria for the unit selection, and the procedure used to recruit students for participation for each study (from pilot to case study 4) are provided in their relevant sections of this chapter.

### **4.3.2 Data Collection Method and Materials**

An online (web-based) questionnaire was used to gather the data for the student perspective study. The data collection method involved collecting opinions and preferences of students with respect to early alerts. The process of data collection is in line with the research conducted by many other researchers (Asby 2015; Britto & Rush 2013; Cai, Lewis & Higdon 2015; Campbell 2007; Donnelly 2010; Habley et al. 2010; Jayaprakash et al. 2014; Kangethe & Muhuro 2014; Simons 2011; Tampke 2013). There are advantages of using an online questionnaire over

traditional data collection techniques (e.g. paper-based or telephone-based). Some of the benefits discussed in the literature are convenience, low administration costs, rapid collection times, and ease of data entry and analysis.

Self-report surveys are a common method in education research for assessing students' attitudes, behaviours, engagement and academic performance (Guo et al., 2015; Ratelle & Duchesne, 2014; Yeager et al., 2016). According to Appleton et al., (2006), self-reported methods are valuable for evaluating emotional and cognitive engagement which are not easy to assess as compared to capture of behaviour-based data. Other advantages mentioned in the literature are as follows: (1) pragmatic; (2) easy administration; (3) less costly; (4) time efficient; (5) no special knowledge or (reading/literacy) skills required; (6) cover more contexts and situations. Other methods also exist such as experience sampling, teacher ratings of students, interviews and observations but each of them has their own pros and cons. In the context of this study, we sought to include as many students as possible and these methods require greater effort to obtain data and analyse which would have restricted our sample size.

In this research in a more general sense, students were asked questions regarding their attitudes towards receiving an alert/intervention, change in behaviour if they have received one and opinions related to whether a student wants to receive an early alert, when, how and in what form they want that alert. A common point of view of researchers for using self-reported methods in the education domain is that it is critical to collect data related to students' opinions and preferences as compared to collecting data on behavioural indicators such as attendance and assessment completion. We relied on self-reported data as it helped us to include items to measure the multi-dimensional constructs (Figure 4.1) for our student survey.

The following sections provide details of the questionnaire development process.

### 4.3.3 Questionnaire Development

This study was exploratory (i.e. attitudes and opinions of students towards early alerts), therefore, the question development process employed the basic principles for designing a good questionnaire as recommended in the literature (Bryman and Bell, 2015; Mark Saunders et al., 2012; Sekaran, 2006).

The conceptual structure was formed through a number of approaches:

- literature review
- consideration of the Australian higher education sector such as the vocabulary used in our institution, for example, unit, unit convenor, HECS census date and exclusion date
- extensive consultation with my research supervisors
- comprehensive discussions with unit convenors of the participating units

The conceptual structure of the student survey reflects the idea that student engagement and academic success in a unit is a combination of many factors. We derived these factors from our theoretical framework discussed in chapter 1 (section 1.4) and chapter 2 (section 2.2.5). Based on our theoretical framework, we have proposed a taxonomy to understand students' opinions, preferences and attitudes towards early alerts. In our taxonomy, we have viewed student engagement and academic success at a unit-level as a multi-dimensional construct comprised of four conceptual areas. There are multiple question items for each conceptual area (see Figure 4.1 below). The question items and response categories were designed to flow logically and use clear and common language.

The demographic information questions included student ID, unit code for which the respondents are filling the survey in, gender, age, first language, ethnicity, student status (e.g. first year first semester, first year second semester, continuing student or came from another university), enrolment mode (e.g. full-time or part-time), faculty, and employment hours per week. Some of these items were refined based on their generalisability to students from diverse backgrounds, doing different degrees and studying in different modes (educational contexts).

To encourage participation in the study and to avoid response bias, different types of questions were used such as binary, multiple choice, open ended, and scaled-responses. The preliminary version of the questionnaire was tested via an initial

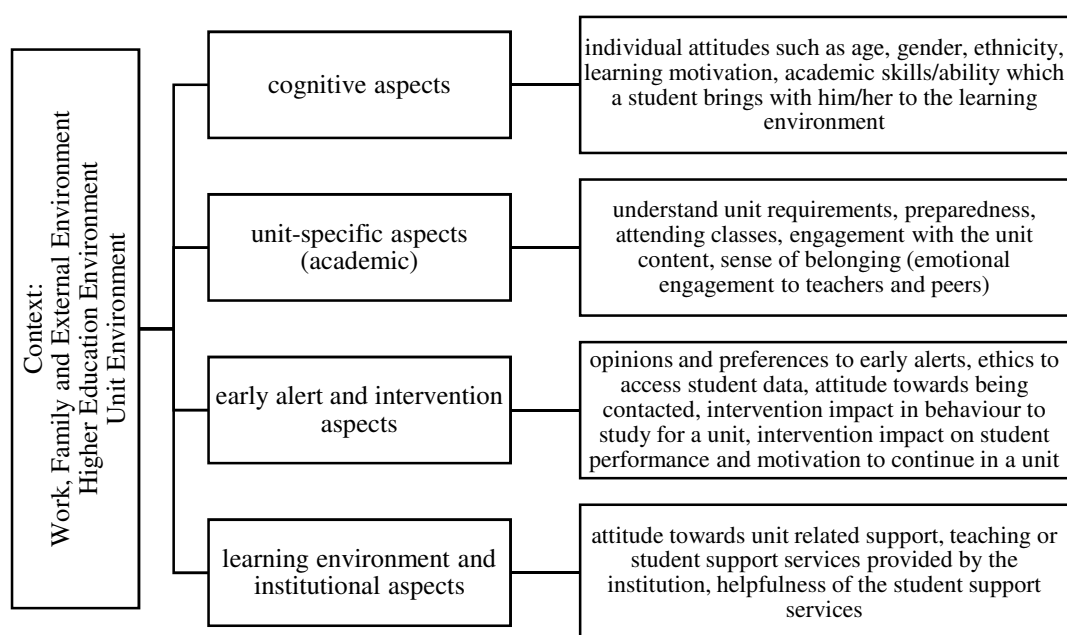
pilot study, presented below, to refine the research focus and assess the content and structure of the initial questionnaire. As mentioned in the introduction of this chapter, we collected the data over two years and each of the case studies including the pilot helped us to identify and understand the challenges associated with students' opinions and preferences with respect to early alerts. We wanted to gather students' opinions at the start of a semester and see whether their opinions changed as the semester progressed. Further, we wanted to investigate whether their opinions and preferences changed following receipt of alerts. Therefore, as outlined in Chapter 1, our research question regarding the student perspective (What are the opinions and preferences of students with respect to early alerts?) was further divided into the following sub-questions:

- What is the attitude of students receiving an early alert/intervention?
- Do students report change in behaviour for how they studied for a unit, if they actually receive an early alert?
- Do early alerts increase student performance and motivation to continue in the unit?
- Do early alert notifications increase student motivation to utilise the campus student support services?

To capture changes in students' attitudes and self-reported behaviours over the semester, and potentially in response to receipt of one or more alerts, in pilot and case study 1 some questions were asked at two separate time points (typically, week 3 and week 12/13 of the semester), resulting in two surveys which we refer to as *Initial* and *Follow-up* surveys. The Initial (week 3) survey consisted of the questions related to demographics, early alerts, unit specific information and other considerations about student early alert systems. Additional questions forming a fourth section in the Follow-up (week 12/13) survey asked about the early alert process and intervention. Topics covered in the survey included areas of academic struggle, type and quality of communication with the teaching staff, attitudes towards the interventions, types of university services required and received, and helpfulness of interventions. The surveys are provided in the respective appendices (C and E).

### 4.3.3.1 Questionnaire Content and Structure

Using our theoretical framework (from chapter 1), we developed the student survey used in this study incorporating the demographic and cognitive aspects, unit-specific aspects, early alerts and intervention aspects and learning environment and institutional aspects (Astin 1993; Atif, Richards & Bilgin 2013; Bean 1980; Nelson 2014; Pascarella & Terenzini 1983; Swail 2004; Tinto 1975). Therefore, the questionnaire administered in the case studies had four main sets of questions with sub-sections (Figure 4.1).



**Figure 4.1: Taxonomy of multi-dimensional constructs for the student survey**

The *demographic and cognitive aspects* refer to the individual characteristics and attitudes such as age, gender, ethnicity, learning motivation, academic skills/ability which a student brings with him/her to the learning environment and external factors such as attitude towards learning, family responsibilities, hours of employment, family and peer influence and others. The *unit-specific aspects* were measured by number of units studying, whether the unit was studied for the first time or by a repeat student, read the unit guide, aptitude to understand the unit requirements, preparedness (skills/abilities to undertake the unit), attending classes, engagement with the unit content and sense of belonging (emotional engagement to the teachers and peers). The *early alert and intervention aspects* were measured by behavioural engagement regarding their attitudes to early alert and intervention

such as whether students are willing to be contacted, what their preferences are concerning contact, whether they will change their behaviour and give access to their data. The *learning environment and institutional aspects* relates to the ability of the institution to provide relevant academic and social support to students during the time of their enrolment with the institution. These aspects were measured by the questions related to the teaching or student support services provided by the institution, helpfulness of the student support services such as hours of operation.

### **Context (Demographic) and Cognitive Aspects**

In addition to measuring the factors related to the four conceptual areas, both surveys were designed to collect information on certain aspects of students' educational contexts as well as demographic information. This information can be used to manage survey administration and allow analysis and reporting for student subgroups.

1. Student ID, a Commonwealth Higher Education Student Support Number (CHESSN)
2. Gender
3. Age
4. Language spoken at home
5. Ethnicity
6. Student status
7. Student enrolment by course load
8. Faculty enrolment
9. Employment hours
10. Factors that may affect the academic performance

### **Unit-specific Aspects**

1. No. of units studying
2. Unit was studied for the first time or a repeat student
3. Aptitude to understand the unit requirements
4. Preparedness (study skills and ability to undertake a unit)
5. Learning motivation within a unit
6. Expectations from unit content and unit teaching staff

### **Early Alerts and Intervention Aspects**

1. Opinions and preferences of students with respect to early alerts such as would students like to be contacted? When they like to be contacted? For what specific behaviours? What their preferences are concerning contact? Which strategies would motivate them to seek help?
2. Ethics to access student demographic and academic data to send early alerts about their performance
3. Attitude of students receiving an early alert or intervention
4. Intervention impact on behaviour to study for a unit
5. Specific actions students were advised and actions which students actually took
6. Intervention impact on student performance and motivation to continue in a unit
7. Intervention impact on how students view their unit convenors

### **Learning Environment and Institutional Aspects**

1. Attitude towards unit related support, teaching or student support services provided by the institution
2. Helpfulness of the student support services such as hours of operation

Following the construction of the initial scale, we continued to monitor the literature, refining or adding items as relevant research and theory suggested. The literature that was consulted when constructing items for the student survey used in this thesis are noted in the next paragraph and summarised in Table 4.2.

To address the research questions from student perspective (section 1.5), an online survey was used. The survey incorporated items consistently referenced and included in national and international surveys on student retention, motivation, engagement and satisfaction. Survey items addressing student engagement and motivation were based on widely-used national surveys such as the Student Experience Survey (SES)<sup>22</sup> previously known as University Experience Questionnaire (UEQ) and the Australasian Survey of Student Engagement (AUSSE)<sup>23</sup>, and international surveys such as Noel Levitz Student Satisfaction

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<sup>22</sup> <https://www.qilt.edu.au/about-this-site/student-experience>

<sup>23</sup> <https://www.acer.org/au/ausse>

Inventory (SSI)<sup>24</sup> and John N. Gardener Institute for Excellence in Higher Education survey (Barefoot, Griffin & Koch 2012).

The Student Experience Survey (SES) was developed in 2015 as part of the Quality Indicators for Learning and Teaching (QILT) survey program initiated by the Department of Education, Employment and Workplace Relations (DEEWR) to consolidate the University Experience Questionnaire (UEQ), Course Experience Survey (CEQ), Australian Graduate Survey (AGS) and other employer surveys. SES replaced these surveys to accommodate the inclusion of Non-University Higher Education Institutions (NUHEIs). The SES is based on five conceptual domains including Learner Engagement, Student Support, Teaching Quality, Learning Resources and Skills Development.

The Australasian Survey of Student Engagement (AUSSE) was another tool which became popular within the Australian higher education sector that provides a source of information about students' engagement with learning (Radloff & Coates 2010). AUSSE is conducted by the Australian Council for Educational Research (ACER) in collaboration with universities and other higher education institutions across Australia and New Zealand. It builds on foundations laid by the North American National Survey of Student Engagement (NSSE). However, it has been revised, developed and validated for Australasian higher education (Coates 2010a). The AUSSE measures student engagement through administration of the Student Engagement Questionnaire (SEQ). The AUSSE includes items related to Active Learning, Academic Challenge, Student and Staff Interactions, Enriching Educational Experiences, and Supportive Learning Environment (Coates 2011). AUSSE is a widely used survey for student engagement. Universities pay to participate in the AUSSE survey. ACER analyses the data and provides a range of resources particularly related to the AUSSE survey data only available to the participating universities. To date there have been many institutional replications of the AUSSE such as Irish Survey of Student Engagement (ISSE), UK Engagement Survey and South African Survey of Student Engagement (SASSE) (Buckley 2014; Carty 2015; Strydom & Mentz 2010).

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<sup>24</sup> <https://www.ruffalonl.com/complete-enrollment-management/student-success/student-satisfaction-assessment/student-satisfaction-inventory/samples>

Drawing on international surveys such as Noel Levitz Student Satisfaction Inventory (SSI) and John N. Gardener Institute for Excellence in Higher Education survey, questions related to services and activities that can benefit (first-year) students such as use of early alert/feedback systems and campus support services were included. Some of the items in our student survey are not worded in exactly the same way as items on other survey instruments due to the context of this research (focus of research question) and validation process. However, many of the items in our student survey measure similar aspects of student retention, motivation and engagement as items in other survey instruments which allows for benchmarking and comparisons. Some survey items related to attitude towards early alert and interventions were included to offer respondents the ability to self-report their opinions and preferences towards early alerts and actions taken in response to teacher notifications via the early alert system.

The following Table 4.2 provides a list of items in our student survey and where each item corresponds with an item in other national or international surveys of higher education students.

**Table 4.2: Student survey items corresponding to other national and international surveys**

Items	Benchmark surveys/instruments				
	SES	AUSSE	SSI	John N. Gardener Institute for Excellence in HE	Student Survey
Student ID					X
The unit code for which [I am] filling in this survey is					X
Gender	X	X	X		X
Age	X	X			X
First language	X	X			X
Ethnicity	X	X	X		X
Student enrolment by course load	X	X	X	X	X
Student status	X		X		X
On average, approximately how many hours did [you] spend per week on employment?		X	X		X
Disability	X	X	X		X
Would [you] like to be contacted if [your] performance in a unit is unsatisfactory? And when?				X	X
When would [you] like to be contacted?				X	X
For what specific behaviours do [you] want to be contacted?				X	X
How would [you] like to be advised about opportunities to seek assistance?				X	X
Which strategies do [you] think would motivate you to seek help?	X			X	X
If [you] were asked for permission for [your] data in iLearn, or other academic data held by university, to be used to identify and send early alerts about [your] performance, would [you]?					X
If [you] were asked for permission to access [your] demographic and academic background to support [your] learning, would [you]?					X
This semester, [I am] studying [number of] unit(s).					X
[I am] doing this unit for the first time.					X
[I] have read the Unit Guide.					X
[I] understand the unit requirements.		X			X

Items	Benchmark surveys/instruments				
	SES	AUSSE	SSI	John N. Gardener Institute for Excellence in HE	Student Survey
[I] have the following skills/ability to undertake this unit. -Academic ability -Competitiveness -Computer skills -Problem solving skills -Critical thinking skills -Ability to manage my time effectively -Interpersonal skills	X	X	X	X	X
[I] feel well prepared to undertake this unit.	X	X		X	X
How would you rate [your] motivation in this unit? -I am motivated to do my required work in this unit -I feel confident that I will do well in this unit -I have to work too hard to succeed in this unit -To accomplish my goals, it is important that I do well in this unit -I persist even when an assessment task is challenging for me	X	X			X
Factors, if any, impeded [your] academic performance in this unit?	X	X	X	X	X
Were [you] contacted by a teaching or student support staff at any stage about [your] academic performance in this unit?					X
Did [you] follow-up or take any action as a result of being contacted?					X
What specific action(s) did [you] take when you were first contacted?					X
What was [your] attitude towards being contacted? -I was glad to speak to my teaching staff about my situation -I appreciated that there was someone watching out for me -I was grateful that somebody contacted me about my academic standing in this unit			X	X	X
What impact did receiving an email from [your] unit convenor have on [your] motivation to continue in the unit?		X			X

Items	Benchmark surveys/instruments				
	SES	AUSSE	SSI	John N. Gardener Institute for Excellence in HE	Student Survey
Did receiving an email from [your] unit convenor change how [you] studied for this unit? If so, please provide details. What did [you] change or do differently?					X
What impact did receiving an email have on how [you] viewed [your] unit convenor? -It made me feel like the unit convenor was supporting me to do well -It made me feel like the unit convenor was concerned about me -It made me feel like the unit convenor was interested in what I did in the unit -It made the unit feel more personal			X		X
In future, would [you] want to receive similar emails in all the units that [you] were enrolled in?					X
Do [you] think that receiving emails like this helped [you] to learn and do better in [your] unit?					X
Now that [you] have received email(s) from [your] unit convenor, what would be the impact on [you] if you no longer received emails in other units?					X
Were [you] advised to seek help from any teaching or student support services at [your] institution?	X	X	X	X	X
Which student support services from the campus wellbeing were [you] advised to visit?	X	X		X	X
When [you] were contacted, were [you] provided with information about campus student support services that [you] did not previously know about?	X	X		X	X
What is [your] attitude towards campus wellbeing services relevant to this unit?	X	X	X	X	X
Please indicate how [you] felt about how you were doing in the unit after being contacted by email?					X

Items	Benchmark surveys/instruments				
	SES	AUSSE	SSI	John N. Gardener Institute for Excellence in HE	Student Survey
Which actions(s) were [you] advised to take and/or [you] took? -Speak with the teaching staff -Attend lecture(s) -Attend tutorial, mixed class, workshop or practical -Listen to online lectures -Complete missing/late work (assignments, diagnostic quiz, mid-semester exam, weekly submissions) -Get external coaching -Withdraw from the unit -Apply for special consideration -Other			X	X	X
What is [your] attitude toward interventions and academic standing in this unit? -I feel better prepared to deal with my academic situation -I feel more comfortable now to seek academic assistance during the semester -Now I know where to seek help for my academic studies -I believe that student support services help			X	X	X

#### **4.3.3.2 Scale Development**

Scales (i.e. Likert scale) used in this study are ‘nominal’ and ‘ordinal’. Nominal scales such as categorical responses, dichotomous and multiple choices are mostly used for questions that determined the survey participants’ demographic characteristics (such as ethnic background, enrolment status), unit-specific factors and institutional factors. In all case studies, there were some open-ended questions in various sections to give the respondents the freedom to clarify their responses. Likert scales were used in questions that were used to investigate respondents’ skills/abilities to undertake a unit, motivation in a unit, attitude towards being contacted, attitudes toward interventions, and academic standing in a unit. Mostly, the five-point attitude Likert scale (also known as summated rating scale) was used in this study as described by Rensis Likert in 1932. The five-point rating scale was chosen because it is the most commonly used scale and has been applied in many student perspective studies and information system (IS) literature conducted in the past (Daniel, Papadopoulos & Thiran 2013). The response scale was coded as follows: Strongly Disagree/Not Competent/Not True=1; Disagree/Somewhat Competent/Slightly True=2; Neutral/Uncertain/Moderately True=3; Agree/Competent/Mostly True=4; and Strongly Agree/Highly Competent/Very True=5.

The full version of the student survey contained 50 items intended to measure the opinions and preferences of students with respect to early alerts. The table in Appendix F present the items with their response scales (binary, multiple choice, open ended, and a 5-point Likert type rating).

#### **4.3.4 Instrument Validity and Reliability**

Validity is defined as, “the ability of an instrument to measure what it is intended to measure” (Onwuegbuzie 2000). In general, validity is determined to confirm that the study conducted provide the answers to the research questions for which it was undertaken using appropriate methods and procedures. For instrument validity, the survey is usually evaluated in terms of readability, feasibility, layout and style, and clarity of wording (Bolarinwa 2015). For this study, the *face validity*, *content validity* and *construct validity* of the survey is calculated. *Face validity* means that each question on the questionnaire must have a logical link with the aim of the

study. *Content validity* means to assess the content in the questionnaire that how well the questions measure what it was intended. We used case studies, both international and national (section 2.4.1) and existing questionnaires (section 4.3.3.1) to design the questionnaire items. In addition to review by both of my research supervisors who are also experienced unit convenors, the questionnaire was reviewed by every convenor of the units in which the survey was administered. Minor modifications to questions' wordings or in few cases 1-2 questions were dropped/added in consultation with the unit convenors by making sure that the modifications were aligned with the ethics approval and research goals of this study.

In the initial design of the student survey, based upon a literature review, four multi-dimensional concepts related to student engagement and academic success at a unit-level were identified (Figure 4.1): cognitive aspects; unit-specific aspects; early alert and intervention aspects; and learning environment and institutional aspects. For each of these theoretical concepts multiple items were constructed. For the *construct validity* of the survey, we present the results from the final case study (case study 4) here, an exploratory factor analysis (principal component analysis) with rotated component matrix (Varimax with Kaiser Normalisation). The Kaiser-Meyer-Olkin (KMO) measure of sampling acceptability was 0.757, indicating a balanced factor solution and a significant result on Bartlett's test of Sphericity (chi-square = 1184.322, degree of freedom = 351,  $p < 0.000$ ) indicated that the variables in the model correlated well with each other. Based upon the scree plots and various factor analyses with 4 to 6 factor solutions, where we considered co-efficients above 0.5, the best solution, both in terms of statistical and theoretical relevance, was a five-factor model, explaining a total variance of 59.3%.

As shown in Table 4.3, the first nine items loaded on the first factor, which we labelled as '*unit expectations and engagement*', as the items loading on this referred to student preparedness, engagement and motivation in the unit (for example, 'I am motivated to do my required work in this unit' and 'I was grateful that somebody contacted me about my academic standing in this unit'). The sixth item 'I believe that student support services help' also loaded on the fourth factor. However, conceptually this item fits better with '*unit expectations and engagement*' as this is a student's expectation that support services will be helpful. The second factor was labelled as '*skills and abilities*', as the five items loading on this referred to

students' skills and abilities to undertake a unit (for example, 'problem solving skills' and 'critical thinking skills'). We labelled the third factor as '*student-teacher interaction*', as four of the items loading on this referred to the intervention impact on students' how they viewed their unit convenor after receiving an early alert (for example, 'It made me feel like the unit convenor was supporting me to do well' and 'It made me feel like the unit convenor was concerned about me'). The fourth factor was labelled as '*helpfulness of student support services*', as the four items loading on this referred to students' learning environment and institutional aspects such as attitude towards unit related support and the support services provided by the institution (for example, 'student support services were available to help me' and 'student support services provided me with the accurate information'). The fifth factor was not labelled as the two items loading on this factor were conceptually related to '*helpfulness of student support services*' so we merge them onto the fourth factor.

**Table 4.3: Factor loadings of the Final case study (Case Study 4) questionnaire**

Item	Rotated Component Matrix				
	1	2	3	4	5
	Unit Expectations and Engagement	Skills and Abilities	Student-Teacher Interaction	Helpfulness of Student Support Services	
Academic ability	0.67				
I am motivated to do my required work in this unit	0.70				
I feel confident that I will do well in this unit	0.75				
I feel better prepared to deal with my academic situation	0.83				
Now I know where to seek help for my academic studies	0.62				
I believe that student support services help	0.56			0.54	
I feel more comfortable now to seek academic assistance during the semester	0.74				
I appreciated that there was someone watching out for me	0.67				
I was grateful that somebody contacted me about my academic standing in this unit	0.68				
Competitiveness		0.69			
Computer skills		0.73			
Problem solving skills		0.72			
Critical thinking skills		0.70			
Interpersonal skills		0.79			
It made me feel like the unit convenor was supporting me to do well			0.79		
It made me feel like the unit convenor was concerned about me			0.83		
It made me feel like the unit convenor was interested in what I did in the unit			0.85		
It made the unit feel more personal			0.68		
The hours of operation for the student support services were convenient					0.59
I have to work too hard to succeed in this unit				0.60	0.51
Student support services were available to help me				0.57	
Student support services provided me with the accurate information				0.56	
<b>Eigen values</b>	<b>7.76</b>	<b>2.71</b>	<b>2.42</b>	<b>1.80</b>	<b>1.33</b>
<b>Explained variance</b>	<b>28.8%</b>	<b>10.0%</b>	<b>8.9%</b>	<b>6.6%</b>	<b>4.9%</b>

When we compare the labelled factors with the four dimension in Figure 4.1, we can identify factor 1 (*unit expectations and engagement*) with unit-specific and early alerts and intervention aspects; factor 2 (*skills and abilities*) with the cognitive dimension; factor 3 (*student-teacher interaction*) with early alert and intervention

aspects; and factor 4 (*helpfulness of student support services*) with learning environment and institutional aspects.

Next, the reliability analysis of the items was conducted. Reliability is defined as, “the ability of an instrument to create same/similar results each time it is used” (Heale & Twycross 2015). Some researchers have referred to reliability as the consistency of measurement over time. Various methods are available to ensure the reliability of the questionnaire. The four most commonly used methods for reliability include inter-rater reliability (inter-observer reliability), test-retest reliability (multiple-occasions reliability/stability reliability), parallel-forms reliability (equivalency reliability/multiple-forms reliability), and internal consistency reliability (homogeneity reliability) (Bolarinwa 2015; Gunuc & Kuzu 2015; Heale & Twycross 2015; Tinsley & Weiss 2000; Trochim 2005). The selection of reliability methods depends on a number of factors such as the attribute/factor being measured, the type of instrument, the investigator’s skills and available time, the availability of research participants, data collection time, and efforts.

The most popular method of reliability in the behavioural and social sciences is *internal consistency reliability* (Bland & Altman 1997; Cronbach 1951; Drost 2011; Santos & A 1999). The internal consistency reliability can be assessed using split-half reliability (using the Spearman-Brown prophecy formula), the Kuder-Richardson formulas 20 and 21 (aka KR-20 and KR-21) (Kuder & Richardson 1937) and coefficient alpha (Bolarinwa 2015; Heale & Twycross 2015). We have used the KR-20/21 and coefficient alpha to measure the reliability of the questionnaire.

In the *Kuder-Richardson formula 20 (KR-20) or 21 (KR-21) test*, the reliability of questions with dichotomous or two (binary) answers (such as yes or no) with varying or same difficulty is determined respectively. The correlation scores for KR-20 (and KR-21) ranges between 0 and 1, where 0 is no reliability and 1 is perfect reliability. In general, a score of above 0.5 is usually considered reasonable (Feldt 1965; Horst 1953; Kuder & Richardson 1937). The *coefficient alpha* was developed by Lee Cronbach (1951), as a result, it is often referred to as *Cronbach’s alpha*. Cronbach’s alpha is the generalisation of the KR-20 formula. In this test, the reliability of questions is determined with more than dichotomous answers such as

the Likert scale (Cronbach 1951; Santos & A 1999; Tavakol & Dennick 2011). The Cronbach's coefficient alpha also ranges from 0 to 1, the closer the Cronbach's alpha gets to 1, the better the reliability. Cronbach's alpha estimate value above 0.70 is considered as acceptable (Nunally & Bernstein 1978). Further, both researchers suggested that if the value of Cronbach's alpha reliabilities is less than 0.6, they are considered as poor, if the value is 0.7 they are acceptable and the reliabilities value above 0.8 are considered good (Nunally & Bernstein 1978).

The literature shows that internal consistency reliability cannot be measured for open-ended (Lavrakas 2008) and demographic questions (Swanson 2004). It is important to note here that for open-ended questions, inter-rater reliability should be used but in all case studies including the pilot, the open-ended questions were used as an extension of a question to allow the respondents' to clarify their responses. The reliability of demographic questions is not a point of concern as demographic questions are not designed to measure a single construct/factor and it is unlikely, for example, that a respondent mark that they are between 19-24, then 35-49, then 50 or older in repeated trials. If a person is not going to answer the question honestly, there is nothing a researcher can do to get the correct information (Swanson 2004).

Table 4.4 shows the internal consistency reliability as measured in Cronbach's alpha coefficients for thematically grouped questions regarding unit preparedness related to skills/abilities to undertake a unit; motivation in the unit; expectations from undertaking a unit; expectations from the teaching staff; attitude towards being contacted via an early alert; attitude towards interventions and academic standing in a unit and intervention impact on how the student view the unit convenor. Due to space constraints, Table 4.4 presented here shows the Cronbach's coefficient alpha only for all the studies. A detail reliability analysis table including the means and standard deviations is in Appendix E. For a particular study, the constructs highlighted in grey are questions that were not asked. Across all case studies, the Cronbach's coefficient alphas ranged from 0.721 to 0.818 for skills/abilities to undertake the unit, 0.532 to 0.779 for motivation in the unit, 0.364 to 0.983 for expectations of the undertaking of a unit, 0.82 to 0.938 for expectations from the teaching staff, 0.865 to 0.938 for attitude towards being contacted via an early alert,

0.872 to 0.902 for attitude towards intervention and academic standing in the unit and 0.85 for intervention impact on how the student view the unit convenor.

Cognitive factors such as learning motivation and student expectations of a unit or teaching staff are difficult to measure because human beings are constantly changing due to experiences or other factors in their lives. A student may answer a question in a way that leads to new perceptions but a day, week, or even months later, the same student may answer the question differently. All case studies were conducted at different times so we suggest that the differences could be due to students' experiences with the timing of the instrument administration or learning experience. Though, with the increasing N from pilot to case study 4, the Cronbach values were fluctuating for the expectations factors so we decided to drop the related questions in case study 4.

Another reason was that while talking to unit convenors before case study 4, most unit convenors were of the view point not to include the expectations from the unit and teaching staff [as a direct] question as they thought that undergraduate students especially first year first semester are not well informed about the unit expectations and/or level and nature of students' contact with the teaching staff, and/or a not so good experience with the teaching staff could impact students' academic performance. Moreover, from the results of pilot-case study 3, we concluded that students value teacher-student interactions for learning and support. Therefore, a more relevant (new) question is added to case study 4 regarding the intervention impact on students' how they view their unit convenor after receiving an alert.

Follow-up surveys were conducted in pilot and case study 1. For the pilot Follow-up, 7 of the students responded to confirm that they were contacted by early alert notice and only 5 responded to the rest of the questions. For the case study 1, no students in COMP1XX responded to the week 12 Follow-up survey. From the ISYS1XX, twenty-one students responded to the Follow-up survey. In reality, 11 students were contacted by the teaching staff but only 4 students responded that they were contacted by an early alert notice and only 1 student responded to the questions related to the actions students took as a result of early alert notice.

**Table 4.4: Cronbach's Alpha ( $\alpha$ ) Coefficients for Skills/Abilities, Motivation, Expectations and Attitudes**

Factors (No. of Items)	Pilot (Initial) $\alpha$	Pilot (Follow- up) $\alpha$	Case Study-1 (Initial) $\alpha$	Case Study- 1 (Follow- up) $\alpha$	Case Study-2 (FoSE) $\alpha$	Case Study- 3 $\alpha$	Case Study- 4 $\alpha$
<i>Skills/abilities to undertake the unit (8)</i>	N=23		N=43		N=66	N=999	N=595
Academic ability	0.787		0.721		0.788	0.818	0.809
Competitiveness							
Computer skills							
Problem solving skills							
Programming ability							
Critical thinking skills							
Ability to manage my time effectively							
Interpersonal skills							
<i>Motivation in the unit (5)</i>	N=25		N=43		N=66	N=998	N=595
I am motivated to do my required work in this unit	0.779		0.532		0.732	0.59	0.637
I feel confident that I will do well in this unit							
I have to work too hard to succeed in this unit							
To accomplish my goals, it is important that I do well in this unit							
I persist even when an assessment task is challenging for me							
<i>Expectations of the undertaking unit (3)</i>	N=25		N=39		N=66	N=632	
Easy	0.983		0.705		0.364	0.484	
Minimal course work							
To be contacted regularly with academic support							
<i>Expectations from the teaching staff (3)</i>	N=25		N=39		N=67	N=649	
Quality of teaching is high	0.938		0.915		0.82	0.83	
Teaching staff are approachable							
Teaching staff are usually available to discuss my work and give helpful feedback							

Factors (No. of Items)	Pilot (Initial) $\alpha$	Pilot (Follow- up) $\alpha$	Case Study-1 (Initial) $\alpha$	Case Study- 1 (Follow- up) $\alpha$	Case Study-2 (FoSE) $\alpha$	Case Study- 3 $\alpha$	Case Study- 4 $\alpha$
<i>Attitude towards being contacted via an early alert (3)</i>		N=5				N=51	N=86
I was glad to speak to my unit convenor/lecturer/tutor about my situation		0.938		Only 1 response so cannot calculate reliability	Not asked as NO interventions were done	0.876	0.865
I appreciated that there was someone watching out for me							
I was grateful that somebody contacted me about my academic standing in this unit							
<i>Attitude towards intervention and academic standing in a unit (4)</i>		N=5				N=51	N=80
I feel better prepared to deal with my academic situation		0.872		Only 1 response so cannot calculate reliability	Not asked as NO interventions were done	0.902	0.883
Now I know where to seek help for my academic studies							
I believe that student support services help							
I feel more comfortable now to seek academic assistance during the semester							
<i>Intervention Impact on how the student view the unit convenor (4)</i>							N=84
It made me feel like the unit convenor was supporting me to do well							0.85
It made me feel like the unit convenor was concerned about me							
It made me feel like the unit convenor was interested in what I did in the unit							
It made the unit feel more personal							

The KR-20 coefficient was calculated for questions related to actions students took as a result of early alert notice which had dichotomous responses. An analysis of KR-20 coefficient was performed based on the operationalisation of the nine items. Table 4.5 shows the internal consistency reliability as measured by Kuder-Richardson formula 20 (KR-20) coefficients for various questions related to the actions the students took after receiving an alert in the pilot study only.

**Table 4.5: KR-20 Coefficients for actions student took as a result of early alert notice in Pilot Study**

Factors (No. of Items)	Mean	*SD	KR-20 Coefficient
<i>Actions students took as a result of early alert notice (9)</i>			N=5
Did you follow-up or take any action as a result of the early alert notice?	1.4	0.548	0.55
Were you advised to seek help from HELP 101 or any student support services?	1.6	0.548	
Did the early alert notice provide you with campus student support services that you did not previously know about?	1.6	0.548	
Did you turn in missing/late work?	1.6	0.548	
Did you apply for Special Consideration for any assignments?	0	0	
Did you apply for Special Consideration for any assessments (diagnostic quiz or mid-semester exam)?	0	0	
Did you make up/redo any weekly submissions?	0	0	
Did you get tutoring help outside the university?	1.8	0.447	
Did you visit a coaching centre outside the university?	0	0	

\* SD refers to standard deviation

Four items (did you apply for special consideration for any assignments? did you apply for special consideration for any assessments? did you make up/redo any weekly submissions? and did you visit a coaching centre outside the university?) have the determinant of the covariance matrix as zero (Table 4.5). The SPSS 23.0 deleted the items with zero variance and continued processing the KR-20 coefficient with the remaining items. The KR-20 coefficient was 0.55. Generally, the acceptable limit for KR-20 coefficient is 0.5 (Feldt 1965; Horst 1953; Kuder & Richardson 1937). It is important to note here that the inter-item correlation matrix shows a weak inter-item relationship, therefore in the later studies the items were dropped as independent questions and were made a choice within a multiple choice question.

In summary of this section, for most of the factors the Cronbach's values are in line with Nunally and Bernstein (1978) and Sekaran (2006), all of the measures are above 0.7 are considered to be good and acceptable. Therefore, we believe that the student survey is proved to be a valid and reliable instrument to explore the opinions and preferences of students with respect to early alerts and the prototype intervention system (MEAP) at Macquarie University.

#### **4.3.5 Ethical Considerations**

In order to invite students to participate in the study, it was necessary to seek ethical clearance from the Human Research Ethics Committee (HREC) of the university where this PhD study was conducted. Subsequently, this had to be reviewed and then approved for the research to commence. Approval (approval number 5201300866) was given for the research to commence on November 29, 2013. A copy of the ethics clearance can be found in Appendix A.

In this student perspective study, the online survey using Qualtrics (<http://www.qualtrics.com>) (Qualtrics 2014) was accompanied with an information and consent form (Appendix B), which explained the purpose of the research study and ensured confidentiality of the data. The participants were explained that the research was being conducted to explore their perception of and/or identify factors, gather feedback and students' behaviours in order to assess student experiences with the early alert process, and that the participation in the survey was voluntary. They were further informed that they have the right to withdraw from the study at any time without having to give a reason however upon submission of the survey responses, their participation cannot be withdrawn. In addition, the respondents were provided with the contact information of the researcher (name only) and academic supervisors (i.e., telephone number and an e-mail address) so that they can make relevant inquiries or can obtain the results of the study, if they wished.

## **4.4 Pilot Study: December 2013-January 2014**

A pilot study was conducted in Session 3 which was the condensed summer session from December 2013-January 2014 (short 5 weeks' session). At Macquarie University. The classes are run three days every week. Each day corresponds to a week in a normal session. The unit is often taken in the summer session as a catch up unit, for example for failure of the unit during an earlier session or for being a part-time student.

The unit used in the pilot was a core first year unit in the Business Information Systems major with an enrolment of 39 students. It is not a prerequisite for any other unit and it is an elective unit for other students, who are likely to be computing or business students.

This unit was selected because students struggle with the content (20% failure rates were observed over the past three years). Also we had the support of the unit convenor and tutors which was an essential factor in the ethics approval to conduct this research. The survey was open to all students enrolled in the unit. The students were recruited by the unit convenor by posting an invitation message on the news forum of the unit iLearn page to fill in an online questionnaire on Day 3 of the semester.

### **4.4.1 Procedure of Pilot Study**

In preliminary discussions with the unit convenor, we considered the following triggers:

- Missed tutorials and practicals (Low attendance and participation)
- Low scores in assessments and assignments
- Missing work (weekly submissions, quizzes, assignments)
- Not logged in to LMS (for more than a week)
- Discussion postings created (how many?)
- Lecture content or lecture resources not viewed (course view, resource view, URL view, assignment view)

From these possibilities, the triggers identified by the unit convenor (Table 4.6).

**Table 4.6: Pilot Study-Triggers identified by the unit convenor**

<b>Pilot Study – Triggers</b>
Missed workshops/tutorials/practicals (Low participation)
Missing work (assessment tasks)
Not logged in to iLearn (> 1 week)

Prior to the start of semester, we requested the unit convenor to brief tutors about the student questionnaire and give the tutors and students forewarning about alerts being sent. An invitation to the Initial survey was distributed to students on Day 3. The Initial survey contained three sections (see Appendix C). Section I collected student demographic information including an identifier (Student ID). Sections II and III gathered learning and teaching (unit related) factors and institutional factors, respectively. On Day 11 students were sent the Follow-up survey that contained the questions from the Initial survey plus additional questions that ask about the early alert process and intervention (see Appendix C).

Alerts were sent between Days 9-12 under the pseudonym ‘computing study buddy’ rather than the convenor or other person teaching on the unit to reduce the likelihood that students would feel in trouble if the alerts were from the convenor or they felt watched by the teaching staff. It is important to note here that ‘computing study buddy’ is not a human, virtual agent or an avatar. It is a pseudonym used by the researcher to contact students within the LMS (iLearn). The students enrolled in this unit received an introductory email (Figure 4.2) from the ‘computing study buddy’ before sending out the alerts. An example of an alert email is shown in Appendix D.

Dear STUDENT NAME,

I am your Computing Study Buddy, part of an ‘Early Alert’ system. I wanted to make sure that everything is OK with your studies? I will be contacting you in UNIT NAME (sending alerts) via emails/iLearn for (LIST OF TRIGGERS). If you get one of these alerts, it means that your instructor is concerned about your performance in class. I will offer you suggestions that might help you if you are having difficulties due to medical, emotional, psychological, domestic or financial reasons.

Wishing you success in your studies in UNIT NAME.

Sincerely,  
Computing Study Buddy

**Figure 4.2: Pilot Study-Introductory Email from Computing Study Buddy**

The Initial survey was followed by a second survey (previously mentioned as Follow-up survey) on Day 11 to the same cohort. Students completed the questionnaire on an entirely voluntary basis.

We analysed the questionnaire data to identify possible reasons and factors that have the potential to significantly influence a students' disengagement, failure or decision to withdraw. Statistical analysis, descriptive in nature, was performed using Microsoft Excel software. The next section presents the results of the usable data collected in the pilot study (27 responses).

#### **4.4.2 Results of Pilot Study**

The results to all sections of the surveys are presented below, each section in its own subsection. For this study, there were 28 responses to the Day 3 survey, but one was completely blank. There were 14 responses to the Day 11 survey. After screening for usability, 12 responses were found to be complete and usable; 2 were dropped because they were blank. It is important to note that in reality 18 students had been contacted via alerts, but only 6 (33%) of the students responded to the Follow-up survey that they were contacted by early alert notice. Among those 6 students only 5 responded to the rest of the questions. Only one student contacted the tutor after receiving alerts.

The respondents' demographics can be seen in Table 4.7.

**Table 4.7: Pilot Study-Student Demographics**

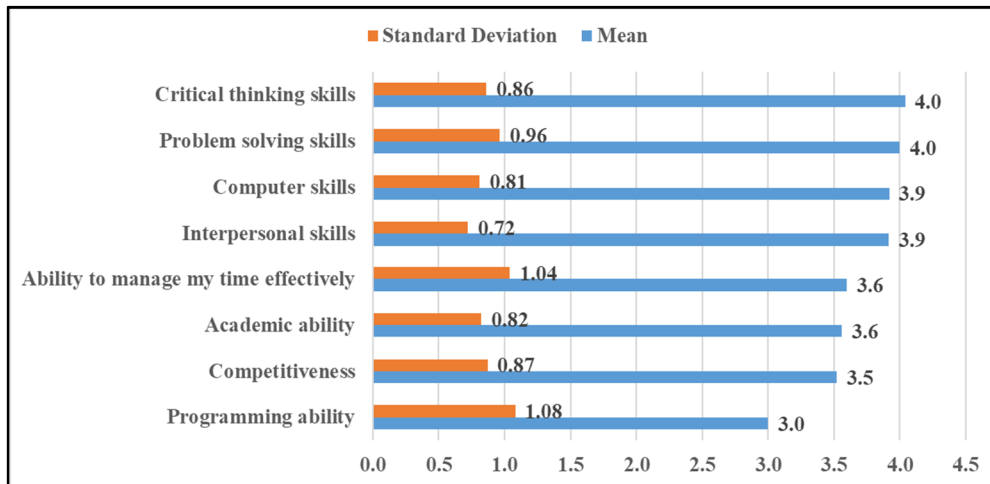
<b>Basic Demographics</b>	<b>Pilot Study</b>	
	<b>N</b>	<b>%</b>
Number of respondents	27	
Gender		
Male	16	64.0
Female	9	36.0
Age		
19-24	21	80.8
25-34	5	19.2
First Language		
English	11	42.3
Other than English	15	57.7
Ethnicity		
International Student	8	32.0
Neither	17	68.0
Student Status		
1 <sup>st</sup> year, 1 <sup>st</sup> semester student in S3-2013	1	3.8
2 <sup>nd</sup> year student	12	46.2
3 <sup>rd</sup> year student	11	42.3
Other	2	7.7
Faculty		
Arts	1	3.8
Business and Economics	15	57.7
Human Sciences	1	3.8
Science and Engineering	9	34.6
Employment Status (hours)		
< 5	6	23.1
5-10	1	3.8
11-15	5	19.2
16-20	2	7.7
> 20	1	3.8
Not working	11	42.3
Other Responsibilities		
Yes	2	7.7
No	24	92.3

*Note:* Totals for a particular demographic question do not add to 27 as of missing values

Twenty-five students (N=25) responded to Section II. For QII.1, 24 students were doing the unit for the first time (96.0%); one was a repeating student (4.0%). Seven students (28.0%) said they have prior knowledge of the unit (e.g. certificate 3 in IT or pre-requisite and co-requisites units) and 18 (72.0%) don't (QII.2). Twenty-four (24) students (96.0%) had read the unit guide and one had not because he forgot (4.0%) (QII.3); 18 (72.0%) said that they completely understood the unit requirements, 6 (24.0%) partially and one did not (4.0%) (QII.4).

The bar chart in Figure 4.3 shows means and standard deviations of the abilities and skills of students (QII.5) where they had chosen the following traits between 1 (not

competent), 2 (somewhat competent), 3 (uncertain), 4 (competent) and 5 (highly competent).



**Figure 4.3: Pilot Study-Mean and Standard Deviation values for student skills and abilities (QII.5) (N=25 except for Critical thinking skills and Interpersonal skills where N=24)**

For QII.6, 12 students said that they were quite well prepared to undertake this unit (48.0%), 8 said fairly well (32.0%), 4 said very well (16.0%) and 1 said unsure (4.0%). For QII.7, the majority of the students (18, 72.0%) stated that they had no programming experience outside this unit and only a quarter of the respondents (7, 28.0%) had programming experience.

In answer to QII.8, 12 were taking the unit as degree requirement (40.0%), 13 wanted to learn more about information systems and computing (43.3%), 2 students were taking this unit as a Planet Unit <sup>25</sup> (6.7%) and 3 students (10%) mentioned others (e.g. as an elective unit and 3 free credit points). The totals do not add to 25 as it is a multiple response question and the participants could check all or no checkboxes.

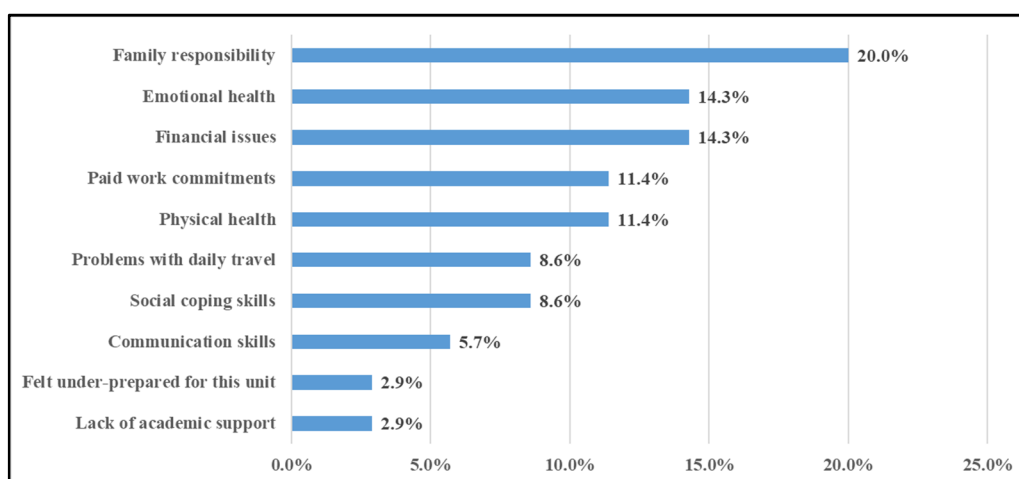
For QII.9<sup>26</sup> (a Likert scale question), motivation in the unit was above neutral 3.8 (0.78); similar to the confidence levels 3.8 (0.80) to do well in the unit. Average score for “*would have to work too hard*” was 3.0 (1.15) which is neutral. To accomplish goals 3.8 (1.11) and persist even when an assessment task is challenging for the respondents 3.7 (0.92) were slightly above neutral.

<sup>25</sup> Planet units are a unique feature of Macquarie University’s undergraduate curriculum. These units enable Macquarie students to develop scientific literacy and to understand the challenges and issues facing the world at present and develop the capacity to be engaged and ethical local and global citizens (Macquarie University Online Handbook).

<sup>26</sup> The values are presented as Mean (Standard Deviation)

In a question (QII.10a) regarding if there are factors that may affect their academic performance in the unit, 12 students (48.0%) thought there were factors that may affect their academic performance in this unit and 13 students (52.0%) thought there were not.

Figure 4.4 is the bar chart showing percentages for QII.10b concerning what obstacles impeded students' academic performance.



**Figure 4.4: Pilot Study-Factors that can affect students' academic performance (QII.10b, N=12)**

Table 4.8 presents the results for questions II.11 - II.13 which cover whether a student wants to receive an early alert, when, how and in what form they want that alert to take. When asked about student preferences for seeking help (QII.14) (N=24), 16 (24.4%) students preferred meeting with tutor(s), followed by talking to the lecturer (14 students, 21.2%). Seven (10.6%) students said they preferred to receive a written plan from the lecturer and 7 students (10.6%) said that they can manage themselves. Six students (9.1%) thought getting an email/letter about how they are doing in a class is enough; and 5 students (7.6%) thought attending a workshop/seminar, actively participating in discussion forums (4 students, 6.1%), talking with a counsellor/support services (3 students, 4.5%), meeting with other students to form a study group (2 students, 3.0%) and getting a phone call from unit convenor/lecturer (2 students, 3.0%) would motivate them to seek help.

**Table 4.8: Pilot Study-If, when, why and how to be sent alerts\***

Questions	N	%
<b><i>If &amp; when students like to be contacted? ( QII.11) (N=16)</i></b>		
Want to be contacted	16**	51.6
As soon as it occurs	16	51.6
The first time it occurs	4	12.9
Following first assessment results	3	9.7
Before Census date	3	9.7
Before exclusion date	3	9.7
Only after it happens more than once	2	6.5
<b><i>For what specific behaviours students like to be contacted? (QII.12) (N=25)</i></b>		
Low scores in assessments/assignments	16	24.6
Missing work	11	16.9
Frequent absences	5	7.7
Announcements in iLearn not read	5	7.7
None	5	7.7
Not logged in to iLearn for more than a week	4	6.2
Lack of participation/effort	4	6.2
Lecture resources/content not viewed	4	6.2
In-class behavioural problems	4	6.2
No participation in discussion forums in iLearn	3	4.6
Not reading discussion posts in iLearn	2	3.1
Other	2	3.1
<b><i>How would you like to be advised about opportunities to seek assistance? ( QII.13) (N=24)</i></b>		
Email	23	53.5
Face-to-face	8	18.6
Mobile phone	8	18.6
Home phone	3	7.0
Letter/Post card	1	2.3

\* Totals do not add to N as QII.11 - II.13 were multiple response questions and the participants could check all or no checkboxes. Percentages are calculated from all the responses, not as the percentage participants.

\*\* This question was asked earlier, the follow- up responses are as below.

QII.15 and QII.16 included the expectations of the respondents from the unit and the unit teaching staff. Both were Likert scale questions where N=25. Students expected the unit to be easy 3.8 (1.30); involve minimal course work 3.6 (1.67); and to be contacted regularly with academic support 3.2 (1.09). Expectations regarding the quality of teaching was high 4.12 (0.73); teaching staff are approachable 4.16 (0.75); and teaching staff are usually available to discuss my work and give helpful feedback 4.08 (0.81). Only one student (4.3%) indicated that s/he had a physical disability or a diagnosed learning disability and 22 students (95.7%) had no disability (QII.17, N=23).

There were 26 responses to section III (N=26). A multiple choice question in QIII.1, asked respondents the reasons why they chose to enrol at Macquarie University

where they were allowed to select all that apply out of seven options. Program of study choices (13 students, 30.2%), good reputation (11 students, 25.6%) and proximity to home (10 students, 23.3%) were the most often selected. The totals do not add to N as the participants could check all or no checkboxes. In QIII.2, more than half of the respondents (15 students, 57.7%) said they were not aware of the available university support services. On the contrary, 11 students (42.3%) were aware of the available university support services and they mentioned (in an open ended question) the university services including: campus/student wellbeing, student disability support, support for indigenous students, learning/academic support, library, counsellor, mentorship programs, academic advisor, student support/welfare (financial/accommodation), career hub, medical service, online IT support, security, numeracy centre, ask.mq.edu.au and gym. For QIII.3, the majority of respondents (22 students, 84.6%) said they were currently not taking advantage of any university support services. Only 4 students (15.4%) were taking advantage of the university support services. Out of those who were taking advantage of any university support services, half (2/4) provided further information; one student was registered with the career hub and one student was taking special provisions for exam. In the last question for this section (QIII.4), the majority of the respondents (23 students, 88.5%) said that it would be helpful to have access to a small document, such as a learning support guide (other than unit guide) that outlines the support services available, expectations on students and processes at our institution. Only 3 students (11.5%) thought they did not need such an information document.

The results from the Follow-up survey (Day 11) (intervention questions) are presented next. Twelve students did the Follow-up survey. Half of these students had received alerts. Among those 6 students only 5 responded to the rest of the questions. We report their data here (N=5). For visibility, responses are written in parenthesis for each question. If there is no value against an option, it received no responses.

*Did you follow-up or take any action as result of the early alert notice?*  
(Yes=60%, No=40%)

*What specific action(s) did you take when you were first contacted by an early alert notice?*

- Set an appointment for in-person meeting with my unit convenor/lecturer (0%)
- Emailed unit convenor/lecturer and asked for more information on what to do (20%)
- Ignored the early alert message (20%)
- Got attentive and started to work seriously (40%)
- Other (Please describe.) (20%-Waited for the unit to begin to assess the information required to harness)

*What was your attitude towards being contacted via an early alert notice? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)?* The values are presented as Mean (Standard Deviation) (N=5)

- I was glad to speak to my unit convenor/lecturer about my situation 3.2 (1.09)
- I appreciated that there was someone watching out for me 4.0 (1.22)
- I was grateful that somebody contacted me about my academic standing in this unit 4.0 (1.22)

*Were you advised to seek help from any student support services?*  
(Yes=40%; No=60%)

*Which student support services from the campus wellbeing were you advised to visit?* The totals do not add to 100% as the participants could check all or no checkboxes.

Counselling service (33.3%); Career & Employment service (16.7%); Academic Advice (16.7%); Ask.mq.edu.au (16.7%); and Other (16.7%-General Support).

There was no selection for Financial aid services; Disability service (disability support unit); Welfare service (financial aid services, academic progress issues); Chaplaincy service; Numeracy centre; Health and wellbeing service; Learning skills program; Education services for overseas students (ESOS); and Tech Help.

*Did the early alert notice provide you with campus student support services that you did not previously know about?* (Yes=40%, No=60%)

*What is your attitude towards campus wellbeing services at Macquarie University relevant to this unit?* The totals do not add to 100% as the participants could check all or no checkboxes.

- Student support services were available to help me (40%)
- The hours of operation for the student support services were convenient (10%)
- Student support services provided me with the accurate information/Student support services were able to help resolve my issue/s (10%)

*Which actions(s) were you advised to take?* The totals do not add to 100% as the participants could check all or no checkboxes.

- Speak with the unit convenor/lecturer (20%)
- Attend lecture and tutorials/workshop (10%)
- Listen to podcasts of lectures (10%)
- Show up to lecture and workshop (tutorial and practical) on time
- Complete missing/Late work (assignments, quizzes/tests, weekly submissions)
- I did not take any action
- Other (Please describe)

*Did you turn in missing/late work?* (Yes=40%, No=60%)

*Did you apply for Special Consideration for any assignments/assessments?* (Yes, No=100%)

*Did you apply for Special Consideration for any quizzes/tests?* (Yes, No=100%)

*Did you make up any weekly submissions?* (Yes, No=100%)

*Did you get tutoring help outside the university?* (Yes=20%, No=80%)

*Did you visit a coaching centre outside the university?* (Yes, No=100%)

*Did the Early Alert improve your attendance in this unit?* (Yes=20%, No=20%, Unsure=60%)

*Did the Early Alert improve your learning in this unit?* (Yes, No=20%, Unsure=80%)

*What is your attitude toward interventions and academic standing in this unit? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)?*

- I feel better prepared to deal with my academic situation 2.8 (1.79)
- Now I know where to seek help for my academic studies 3.2 (1.30)
- I believe that student support services help 3.6 (1.14)

*Please indicate how you feel about your current academic standing after you were being contacted by an early alert notification?*

Much better (40%); Somewhat better (20%); About the same (40%); Somewhat worse; Much worse

*How you would NOW rate your expectation(s) from the teaching staff in this unit and REALITY, on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)?*

- Quality of teaching is good 3.8 (1.64)
- Teaching staff are approachable 3.8 (1.64)
- Teaching staff are usually available to discuss my work and give helpful feedback 3.8 (1.64)

*Overall, how satisfied you are with the Early Alert system?*

Completely dissatisfied; Dissatisfied; Neutral (20%); Satisfied (60%); Completely satisfied (20%)

*Is there anything else you would like us to know? (Yes, No=100%)*

#### **4.4.3 Reflections from the Pilot Study**

Before conducting the other studies including the final empirical study, it was necessary to reflect on the lessons learned from the pilot study, what worked well and what could have been revised. The following bullet points summarise the limitations and issues identified in the pilot.

- We had gained ethics approval to ask for the student ID during the survey so that we could see if there was any relationship between satisfaction with receiving an alert and the final grade of the student. Unfortunately, in error, the Student ID was not compulsory to enter in the Initial (Day 3) survey so 23/27 students enter their ID and the Follow-up (Day 11) survey did not collect the student ID. Therefore, we were unable to identify the grade for the students who responded to Follow-up survey.
- For the pilot, the method of recruitment involved posting an invitation message on the relevant unit news forum. This method of recruitment was slower than expected. In most cases the invitation did not attract any volunteers.
- The pilot was conducted in session 3 (a condensed summer session), so time constraints and tight assessment deadlines were also contributing factors.
- Due to its small size (low enrolment in the unit: N=39), the pilot only provided a partial picture of the students' opinions and behaviours towards early alerts.

Despite the above limitations and challenges encountered, the pilot study provided promising initial feedback that students were positive towards the concept of early alerts. To address these limitations, we decided to improve our methods of recruitment, increase the number of units, run in a standard 13 weeks (plus two weeks' mid-semester break) session, and rectify the missing Student ID problem. Modifications were made to the surveys for each case study according to the specific purpose of the case study or the requests of unit convenors. Each modification is described in the following sections reporting the case study design.

## **4.5 Case Study 1: Session 1 (March 2014 – July 2014)**

Case Study 1 was conducted in session 1 (standard 13 weeks' session) from March 2014 - July 2014. The units used in case study 1 were two first year core units from the department of computing. One unit was a programming unit (COMP1XX), core in the Software Technology major, with an enrolment of 64. The other unit (ISYS1XX) was a core in the Information Systems and Business Analysis major, with an enrolment of 367.

These units were selected because of the perceived benefits of automated support. The ISYS1XX unit was a large unit and students struggle with the content (20% failure rates were observed over the past three years). The COMP1XX unit was offered in session 1 as a catch up unit (normally offered in session 2) because the students struggle with the content and the high failure rates (42%) were observed over the past three years. The advantage was that we had the support of the unit convenors and tutors.

We intended to take on board more units from other departments but there was insufficient support from the unit convenors. For example, in one unit from the Department of Statistics, the unit convenor was of the view point that there are already too many surveys students have to do in that unit so s/he is not in favour of including another study in her/his unit. In another unit from the Department of Computing, the unit convenor had just changed the unit design by introducing a new paper-based assessment which formed the major evaluation. Thus, the unit convenor could not see the merit in joining the study as there were almost no online learning activities that could be used as triggers for running an early alert case study.

### **4.5.1 Design and Procedure of Case Study 1**

In preliminary discussions with the unit convenors, we identified the set of triggers in our institutional LMS (iLearn) (Table 4.9). The trigger included low attendance and participation, low scores in assessments and assignments, missing work, not logged in to LMS (for more than a week), discussion postings created (how many?) and lecture content or resources not viewed (course view, resource view, URL view, assignment view).

**Table 4.9: Case Study 1-Triggers identified by the unit convenors**

<b>Case Study 1 – Triggers</b>	
<b>COMP1XX</b>	<b>ISYS1XX</b>
Log into iLearn (not logged in)	iLearn material download
Missing Work <ul style="list-style-type: none"><li>• Randomised Quiz System-IQ (not attempted by census date)</li><li>• Weekly submission (missing)</li><li>• Assignment submission (no submission)</li></ul>	Missing work <ul style="list-style-type: none"><li>• Assessment tasks</li></ul>
Attendance (no attendance)	
Mid semester test (low performance)	

The student surveys were open to all students enrolled in both units. The participants were initially invited by the unit convenor by posting an invitation message on the news forum of the respective unit iLearn pages to fill in an online questionnaire during week 3 of the semester. In our institutional LMS, students received the announcements in their university email. Because of the low response rate to the Initial week 3 survey, we requested the unit convenor to put up an invitation for the survey (a new version including questions from both Initial week 3 and Follow-up week 12 surveys) on the top of the unit iLearn page in week 12 to the same cohort. The survey structure and questions used in our case study 1 was similar to the one used in pilot except one question from section II. The question (QII.14) was regarding strategies to help motivate students to seek help. The convenors of both units felt that asking students about these options would mislead students to think they might receive help in any or all of these ways in the current offerings. A copy of the week 3 and week 12 questionnaires are provided in Appendix C.

The alert and intervention process was the same as was used in the pilot and used the pseudonym ‘computing study buddy’ for sending alerts. Descriptive statistical analysis was performed by using the Microsoft Excel and SPSS 23.0. The next section presents the results.

#### **4.5.2 Results of Case Study 1**

The results to all sections of the surveys are presented next. The demographics of each cohort are presented in Table 4.10. For ISYS1XX, there were 60 responses including 12 blank and 8 duplicates. After removing the duplicates, there were 40 usable responses. We note that only 11 students had been contacted via alerts. None of those 11 students contacted the tutor after receiving alerts. For COMP1XX, there

were 12 responses including 7 blank. After screening for usability, there were 5 responses. We note that only 13 students had been contacted via alerts. None of those 13 students contacted the tutor after receiving alerts. As apparent from the demographics summarised in Table 4.10, the cohorts are different from each other. Thus, we provide separate results for each unit for each section below.

**Table 4.10: Case Study 1-Student Demographics**

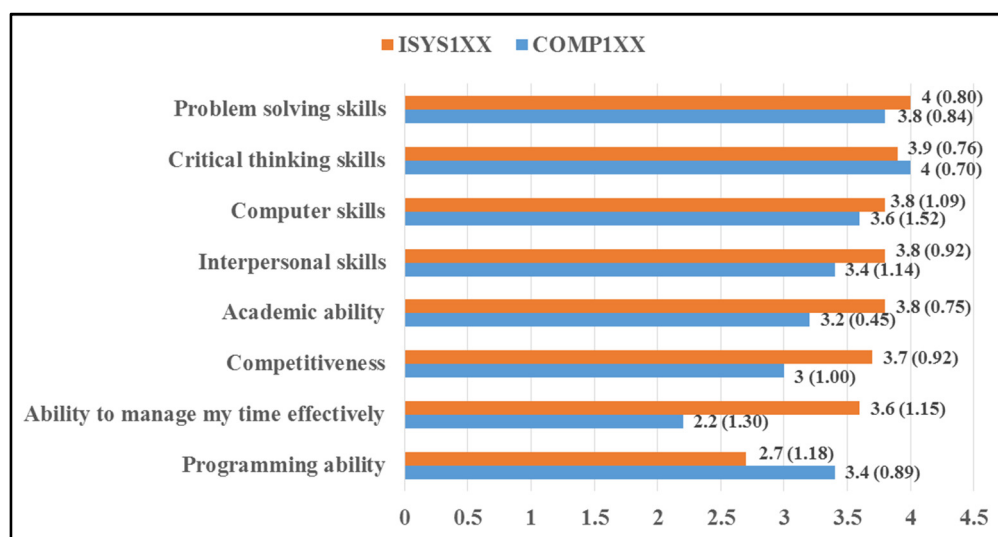
	<b>ISYS1XX</b>		<b>COMP1XX</b>	
<b>Basic Demographics</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
Number of respondents	40		5	
Gender				
Male	24	60.0	4	80.0
Female	16	40.0	1	20.0
Age				
18 or younger	14	35.0	0	0
19-24	22	55.0	5	100.0
25-34	4	10.0	0	0
First Language				
English	29	72.5	2	40.0
Other than English	11	27.5	3	60.0
Ethnicity				
International Student	6	15.0	1	20.0
Aboriginal/Torres Strait Islander	3	7.5	0	0
Neither	28	70.0	4	80.0
Student Status				
1 <sup>st</sup> year, 1 <sup>st</sup> semester student in S1-2014	24	60.0	0	0
I came from another university in S1-2014	3	7.5	0	0
1 <sup>st</sup> year, 2 <sup>nd</sup> semester student in S1-2014	2	5.0	1	20.0
2 <sup>nd</sup> year student	9	22.5	3	60.0
3 <sup>rd</sup> year student	1	2.5	0	0
Other	1	2.5	1	20.0
Employment Status (hours)				
< 5	3	7.5	1	20.0
5 – 10	5	12.5	1	20.0
11 – 15	5	12.5	1	20.0
16 – 20	5	12.5	0	0
> 20	6	15.0	1	20.0
Not working	16	40.0	1	20.0
Other Responsibilities				
Yes	5	12.5	0	0
No	33	82.5	5	100.0

*Note:* Totals for a particular demographic question may do not add to N as of missing values

To allow comparison and present the total numbers, the results for COMP1XX are listed first, followed by results for ISYS1XX.

Five and 39 students responded to questions in Section II (COMP1XX, N=5 and ISYS1XX, N=39); 4 and 37 were taking the unit for the first time; one and two were

repeating students (QII.1). None and nine students said they have prior knowledge of the unit (e.g. MS Excel, MS Access, HSC programming and co-requisites units) and 5 and 30 don't (QII.2). For QII.3, 5 and 39 students had read the unit guide; 3 and 18 said that they completely understood the unit requirements, 2 and 21 partially (QII.4). The clustered bar chart (Figure 4.5) shows means and standard deviations for the abilities and skills of students (QII.5) in two units.



**Figure 4.5: Case Study 1- Mean (Standard Deviation) values for student skills and abilities (QII.5) (COMP1XX, N=5 and ISYS1XX, N=38)**

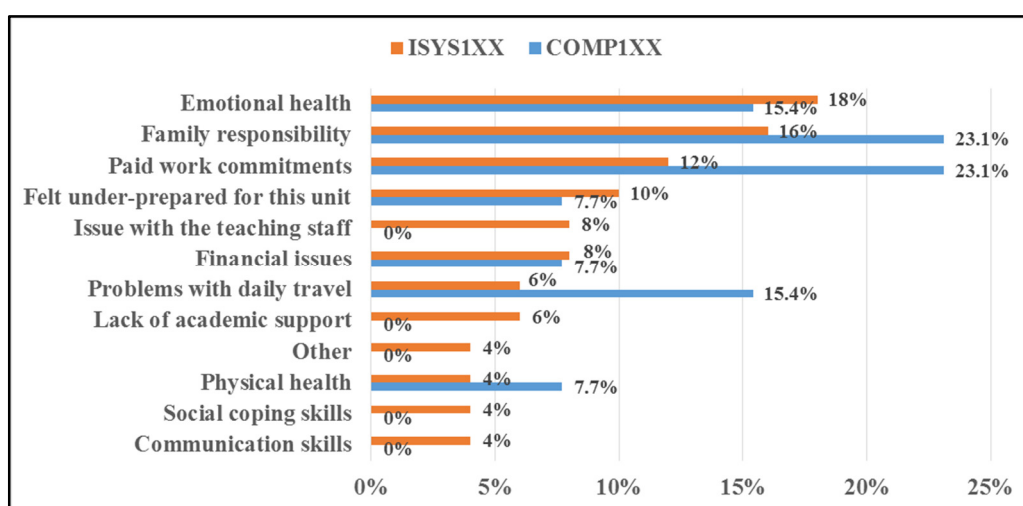
For QII.6, 2 and 16 participants said that they are quite well prepared to undertake this unit, 1 and 12 said fairly well, none and 6 said very well and 2 and 4 said they are very little prepared to undertake this unit. 3 and 8 students had the understanding of the core principals and components of the discipline outside this unit (QII.7). In answer to QII.8, 3 and 35 were taking the unit as degree requirement, 4 and 15 wanted to learn more about computing and information systems. The totals do not add to N in the respective units as it is a multiple response question and the participants could check all or no checkboxes.

For QII.9 (a Likert scale question), the values are presented as mean (standard deviation) for both units (ISYS1XX-N=38; COMP1XX-N=5). The motivation in the unit was slightly above neutral 3.6 (1.14) and 3.8 (1.09) for both units; confidence levels to do well in the unit were below neutral for COMP1XX 2.6 (0.89) and slightly above neutral for ISYS1XX 3.4 (0.99). On average, COMP1XX students believed they did not have to work hard 3.0 (1.87) while ISYS1XX students believed that they would have to work too hard 3.4 (1.24), but not too hard.

Both cohorts were optimistic about accomplishing their goals 4.2 (0.84) and 4.1 (0.86), but COMP1XX students were not as persistent as ISYS1XX students when an assessment task is challenging for them 3.8 (0.84) and 4.3 (0.77) respectively.

In QII.10a, 3 (COMP1XX) and 19 (ISYS1XX) students thought there are factors that may affect their academic performance in the unit that they are studying.

The clustered bar chart (Figure 4.6) shows percentages for the factors affecting students' academic performance (QII.10b) in two units.



**Figure 4.6: Case Study 1-Factors that can affect students' academic performance (QII.10b) (ISYS1XX, N=20 and COMP1XX, N=3)**

Table 4.11 presents the results for questions II.11 to II.13 which cover whether a student wants to receive an early alert, when, how and in what form they want that alert to take.

As mentioned above, QII.14 was dropped by the unit convenors of both units.

**Table 4.11: Case Study 1-If, when, why and how to be sent alerts\***

<b>Questions</b>	<b>%</b>	<b>%</b>
<b><i>If &amp; when students like to be contacted? (QII.11)</i></b>	<b>COMP1XX (N=3)***</b>	<b>ISYS1XX (N=26)***</b>
Want to be contacted	60 (N=5)**	79.4 (N=34)**
As soon as it occurs	33.3	40.4
The first time it occurs	22.2	17.3
Following first assessment results	22.2	15.4
Before Census date	11.1	15.4
Before exclusion date	11.1	9.6
Only after it happens more than once	0	1.9
<b><i>For what specific behaviours students like to be contacted? ( QII.12)</i></b>	<b>COMP1XX (N=4)***</b>	<b>ISYS1XX (N=32)***</b>
Low scores in assessments/assignments	25.0	27.5
Missing work	16.7	18.7
Frequent absences	8.3	11.0
Lack of participation/effort	8.3	9.9
Lecture resources/content not viewed	16.7	8.8
Announcements in iLearn not read	8.3	7.7
Not logged in to iLearn for more than a week	0	5.5
In-class behavioural problems	8.3	5.5
Not reading discussion posts	0	2.2
None	8.3	2.2
No participation in discussion forums in iLearn	0	1.1
<b><i>In the future, how would you like to be advised about opportunities to seek assistance? ( QII.13)</i></b>	<b>COMP1XX (N=4)***</b>	<b>ISYS1XX (N=31)***</b>
Email	60	67.5
Face-to-face	40	30.0
Other	0	2.5

\* Totals do not add to N as QII.11 - II.13 were multiple response questions and the participants could check all or no checkboxes

\*\* Represents the number of unique participants for the question “would you like to be contacted if the performance in the unit is unsatisfactory?”

\*\*\* Represents the number of total responses, since participants were allowed to choose more than one option

QII.15 and QII.16 included the expectations of the respondents from the unit and the unit teaching staff. Both were Likert scale questions answered by COMP1XX (N=5) and ISYS1XX (N=34) students. Students expected the unit to be easy 2.0 (0.70) and 3.0 (0.87); involve minimal course work 2.2 (0.84) and 2.9 (0.92); to be contacted regularly with academic support 2.6 (1.14) and 3.0 (1.13) in COMP1XX and ISYS1XX, respectively. Expectations regarding the quality of teaching (QII.16) was high 4.4 (0.55) and 3.7 (1.10); as well as finding teaching staff approachable 4.0 (0.70) and 3.8 (1.09); and available to discuss their work and give helpful feedback 3.8 (0.84) and 3.7 (1.14) in COMP1XX and ISYS1XX, respectively. Two students in each unit had a physical disability or a diagnosed learning disability (QII.17).

There were 5 and 40 responses for section III in COMP1XX (N=5) and ISYS1XX (N=40). In a multiple choice question (QIII.1), students were asked to select all that apply when considering reason(s) for enrolling at Macquarie University - 2 and 15 selected close to home, 3 and 25 said it had the program they wanted to study, none and 4 said affordable, 3 and 21 selected because of good reputation, 1 and 7 said it was the only university they got accepted, none and 5 said that a family member attended or is attending. The totals do not add to N as the participants could check all or no checkboxes.

For QIII.2, no one in COMP1XX and 25 students in ISYS1XX were aware of the available university support services. In an open ended question, they mentioned the university services including: campus/student wellbeing, student connect, learning/academic support, online IT support, security and MUSE (Macquarie University Spatial Experience). For QIII.3, all and 29 in COMP1XX and ISYS1XX respectively, said they are currently not taking advantage of any university support services. None and 4 in COMP1XX and ISYS1XX respectively, are taking advantage of the university support services. From ISYS1XX, out of those 4 students who are taking advantage of any university support services one student was registered with the *career hub*, one student was registered with *student disability support*, one had been to *campus wellbeing* and the last one was utilising *the accommodation facility*. In the last question for this section (QIII.4), 4 and 29 from COMP1XX and ISYS1XX respectively, said that it would be helpful to have access to a small document, such as a learning support guide (other than unit guide) that outlines the support services available, expectations on students and processes at our institution and 1 and 4, in COMP1XX and ISYS1XX respectively, thought they did not need such a helping document.

No students in COMP1XX responded to the week 12 *Follow-up* survey. Thus, the results presented next for the Follow-up survey questions regarding interventions concern ISYS1XX students only. Twenty-one students (52.5%) responded to the Follow-up survey. Although 11 students were contacted by the teaching staff, only 4 students responded that they were contacted by an early alert notice. Because in the Follow-up survey we were mostly interested in analysing the effect of receiving an alert on students' attitudes and behaviours, we focus on their data here. For

visibility, responses are written in parenthesis in front of the questions. If there is no value against an option, it received no response.

*Did you follow-up or take any action as result of the early alert notice?*  
(Yes=25%, No=75%)

*What specific action(s) did you take when you were first contacted by an early alert notice?*

- Emailed unit convenor/lecturer and asked for more information on what to do (100%)
- Set an appointment for in-person meeting with my unit convenor/lecturer
- Ignored the early alert message
- Got attentive and started to work seriously
- Other (Please describe)

*What was your attitude towards being contacted via an early alert notice? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)?* N=1 so standard deviation cannot be calculated.

- I was glad to speak to my unit convenor/lecturer about my situation (mean=5.0)
- I appreciated that there was someone watching out for me (mean=4.0)
- I was grateful that somebody contacted me about my academic standing in this unit (mean=4.0)

*Were you advised to seek help from any student support services?*  
(Yes; No=100%)

*Which student support services from the campus wellbeing were you advised to visit?*

Ask.mq.edu.au (100%)

There was no selection for Financial aid services; Disability service (disability support unit); Welfare service (financial aid services, academic progress issues); Chaplaincy service; Numeracy centre; Health and wellbeing service; Learning skills program; Education services for overseas students (ESOS); Tech Help; Counselling service; Career & Employment service; Academic Advice; and Other (Please describe).

*Did the early alert notice provide you with campus student support services that you did not previously know about?* (Yes, No=100%)

*What is your attitude towards campus wellbeing services at Macquarie University relevant to this unit?*

- Student support services were available to help me (50%)
- The hours of operation for the student support services were convenient (50%)
- Student support services provided me with the accurate information
- Student support services were able to help resolve my issue(s)
- Other (Please describe)

*Which actions(s) were you advised to take?*

- Speak with the unit convenor/lecturer (25%)
- Attend lecture and tutorials/workshop (25%)
- Listen to podcasts of lectures (25%)
- Show up to lecture and workshop (tutorial and practical) on time (25%)
- Complete missing/Late work (assignments, quizzes/tests, weekly submissions)
- I did not take any action
- Other (Please describe)

*Did you turn in missing/late work? (Yes, No=100%)*

*Did you apply for Special Consideration for any assignments/assessments? (Yes, No=100%)*

*Did you apply for Special Consideration for any quizzes/tests? (Yes, No=100%)*

*Did you make up any weekly submissions? (Yes, No=100%)*

*Did you get tutoring help outside the university? (Yes=20%, No=80%)*

*Did you visit a coaching centre outside the university? (Yes, No=100%)*

*Did the Early Alert improve your attendance in this unit? (Yes, No, Unsure=100%)*

*Did the Early Alert improve your learning in this unit? (Yes, No, Unsure=100%)*

*What is your attitude toward interventions and academic standing in this unit? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)? N=1 so standard deviation cannot be calculated.*

- I feel better prepared to deal with my academic situation (mean= 3.00)
- Now I know where to seek help for my academic studies (mean=3.00)
- I believe that student support services help (mean=4.00)

*Please indicate how you feel about your current academic standing after you were being contacted by an early alert notification?*

Somewhat better (100%); much better; about the same; somewhat worse; much worse

*Overall, how satisfied you are with the Early Alert system?*

Completely dissatisfied; dissatisfied; neutral; satisfied (100%); completely satisfied

*Is there anything else you would like us to know? (Yes=9.5%, No=90.5%)*

### **4.5.3 Summary and Reflections from the Case Study 1**

The purpose of case study 1 was the validation of the revised survey and to capture the data from more than one unit. The survey was conducted in a standard 13 weeks' session in two first year core units. The case study 1 was conducted to identify at-

risk students according to the triggers specified by the unit convenors (Table 4.9) and to send interventions to identified students. Similar to the pilot study, Initial and Follow-up surveys were used and alerts were sent under a pseudonym ‘computing study buddy’. We noted very low response rate especially in the COMP1XX unit and there was no response for the week 12 *Follow-up* survey. Therefore, it is difficult to compare the students’ attitudes and behaviours to early alerts.

In order to answer our research question about opinions and preferences of students with respect to early alerts, it is interesting to note in case study 1 the majority of students from both units want to be contacted if their performance in the respective unit is unsatisfactory. They want to be contacted as soon as it occurs or the first time it occurs (when to be contacted?); for low assessment scores, missing work and low absences (why to be contacted?); and they want to be contacted via email (how to be contacted?) and face-to-face rather than phone call or letter/post card.

## **4.6 Case Study 2: Session 1 (May 2014 – July 2014)**

A Case Study 2 was conducted in Session 1 from May 2014-July 2014. The units used in this case study were first year units from the departments of computing, physics and mathematics within the Faculty of Science and Engineering (FoSE). The units in this study were chosen because they had been identified by the FoSE Academic Standards and Quality Committee as *units at-risk*. One of these identified units COMP1XX was a large unit offered within our department and students struggle with the content (28% failure rates were observed over the past three years). The failure rates for the other two units were not included as we do not have access to failure rates in units outside our department.

### **4.6.1 Design and Procedure of Case Study 2**

The survey was conducted between May 31, 2014 and July 31, 2014. An initial personalised invitation to complete the survey was sent via university email (using Qualtrics) to 810 students who were enrolled in first year units such as COMP1XX, PHYS1XX and MATH1XX. The first invitation was sent at the end of semester. A reminder email was sent after 2 weeks. Students completed the questionnaire on an entirely voluntary basis.

Each contacted student received a copy of the following documents:

- A recruitment e-mail containing the link to the survey.
- An information and consent form following the survey questions. This explained the nature of the research and emphasised the confidentiality of their responses (Appendix B).

The survey instrument consisted of questions related to demographics (Section I), early alerts (Section II), institutional factors (Section III) and unit specific information (Section IV). The survey structure was a little different from the pilot and Case Study 1. The questions on institutional factors were presented before the unit specific questions. The unit specific section was modified by first asking how many units the student was currently enrolled in session 1 2014. The unit specific questions were repeated based on the number provided in answer to this question. For each repetition, students were first asked to enter the unit ID for one of their units and answer the questions with that unit in mind until all units had been covered. In total we identified that students mentioned 55 different units. We were asked to implement this design by the Chair of the FoSE Academic Standards and Quality Committee so that comparisons could be made between these units and unit ‘at-risk’ to clarify whether the student experience and expectations were similar to other units not reporting the same high failure rates. For this case study, the analysis of the unit specific questions was reported only for COMP1XX, PHYS1XX and MATH1XX.

#### **4.6.2 Results of Case Study 2**

Ninety-five (95) students agreed to participate by checking the information and consent statement radio button; 39/95 did not finish the survey; 39 include both incomplete attempts to all sections and blank responses (blank responses=10 and incomplete attempts to all sections=29). After screening for usability and reliability, 85 responses were found to be complete and usable; 10 were dropped because they were blank. Of these responses, 85 completed the demographics (Section I), 70 completed the alerts section (Section II), 69 completed the institutional factors section (Section III), and 78 completed the unit specific information section (Section IV). The number of respondents who completed every section of the

survey was 56. If we define the completion rate as the ratio of the number of surveys completed to the number of surveys started (that is, agreed to participate by checking the information and consent statement radio button), we found a survey completion rate of 59% ( $56/95=59\%$ ).

Section I collected student demographic information including an identifier (Student ID) so that we can match their achievement in the unit from another database. Table 4.12 presents the selected demographic attributes (QI.1-QI.7) of the respondents.

**Table 4.12: Case Study 2- Student Demographics**

<b>Basic Demographics</b>	<b>Respondents</b>	
	<b>N</b>	<b>%</b>
Number of respondents	85	
Gender		
Male	55	64.7
Female	28	32.9
I don't identify as male or female	2	2.4
Age (years)		
18 or younger	27	31.8
19-24	48	56.5
25-34	6	7.1
35-49	1	1.2
50 or older	3	3.5
First Language		
English	67	78.8
Other than English	18	21.2
Ethnicity		
International Student	4	4.7
Aboriginal/Torres Strait Islander Student	2	2.4
Neither	79	92.9
Student Status		
1 <sup>st</sup> year, 1 <sup>st</sup> semester student in S1-2014	50	58.8
I came from another university in S1-2014	7	8.2
1 <sup>st</sup> year student, 2 <sup>nd</sup> semester student in S1-2014	4	4.7
2 <sup>nd</sup> year student	14	16.5
3 <sup>rd</sup> year student	4	4.7
Other	6	7.1
Faculty		
Arts	10	11.9
Business	2	2.4
Sciences	72	85.7

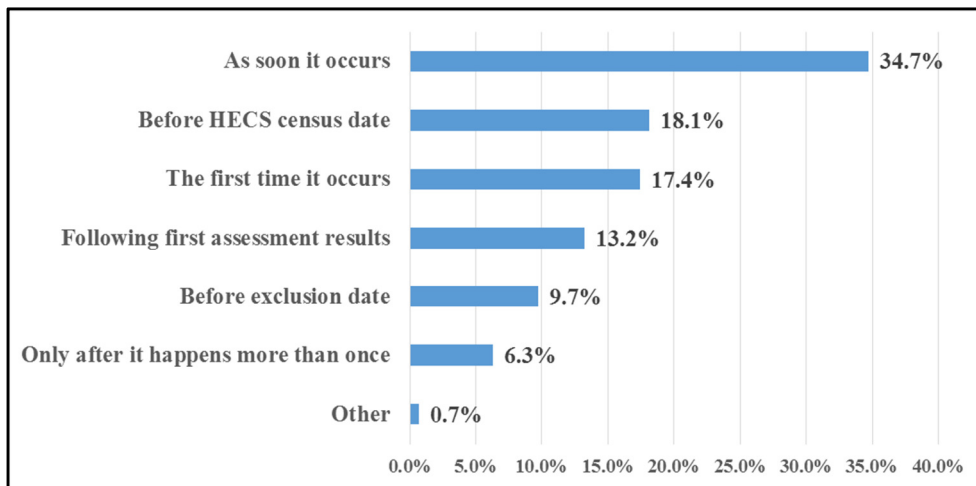
*Note:* Totals for a particular demographic question may do not add to N=85 as of missing values

According to the self-reported employment status (QI.8), 10.6% worked less than 5 hours, 18.8% worked between 5-10 hours, 7.1% worked between 11-15 hours, 14.1% worked between 16-20 hours, 15.3% worked more than 20 hours, and one-third (34.1%) did not work in semester 1, 2014. To report the other responsibilities

such as a carer or similar (QI.9), most of the respondents (89.3%) reported that they do not have a responsibility in semester 1, 2014. Around eleven percent (10.7%) reported that they have the 'Other responsibilities, please specify' such as 'part-time job', 'family responsibilities', 'self-represented in legal proceedings', 'carer' and 'cricket player'. For QI.10, 10.6% reported that they have a physical or diagnosed learning disability and 89.4% do not have a physical or diagnosed learning disability.

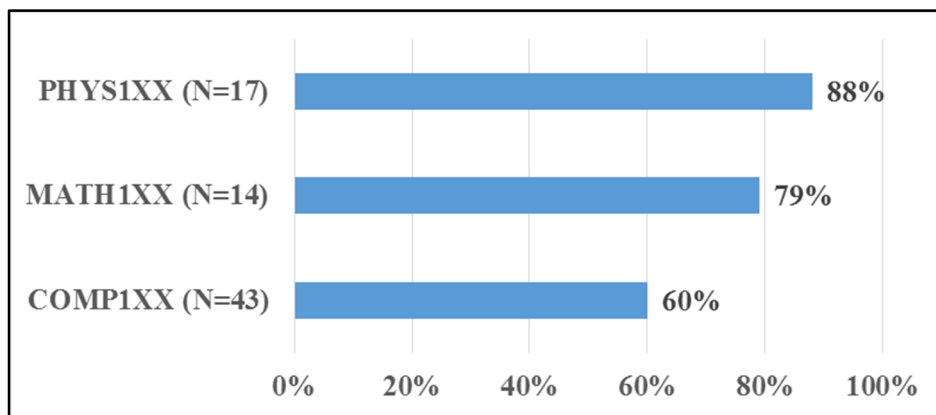
Students in COMP1XX, PHYS1XX and MATH1XX were not separated out because all students are from first year units within the faculty of science and engineering and student characteristics in each group were very similar (i.e. younger school leavers with similar gender distribution and working hours).

Section II aimed to identify student preferences to allow possible design of alerts in future offerings and other units. Students were informed that this section is for future planning only and no alerts in the current offerings of these units will be provided. Questions include whether a student wants to receive an early alert, when, how, and in what form they want that alert to take. Of the 70 respondents who did the alerts section, 63 students (90%) want to be contacted if their performance in the respective unit is unsatisfactory, and only 7 students (10%) would not like to be contacted. Figure 4.7 shows the summary of responses to a multiple response question for N=63 (students who want to be contacted): When you like to be contacted (QII.1). We noted that majority students (34.7%) like to be contacted as soon as their performance in the respective unit is unsatisfactory. Figure 4.7 shows that 1 student (from COMP1XX) reported 'Other, please specify' that he/she would like to be contacted if 'marks are below a student selected average for more than 2 assignments'.



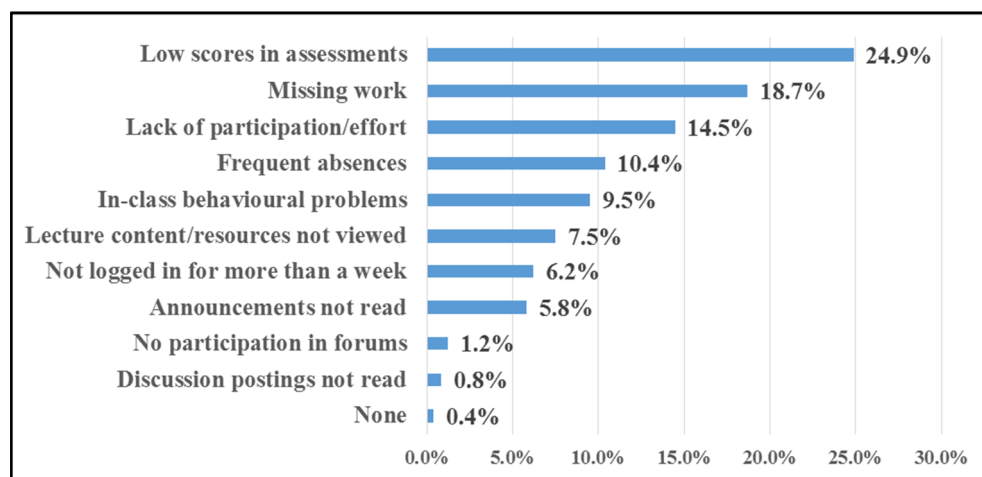
**Figure 4.7: Case Study 2-When students' like to be contacted? (QII.1) (N=63)**

We noted that PHYS1XX students (88%) would like to be contacted as soon as it occurs more than MATH1XX (79%) and COMP1XX (60%) students (Figure 4.8).



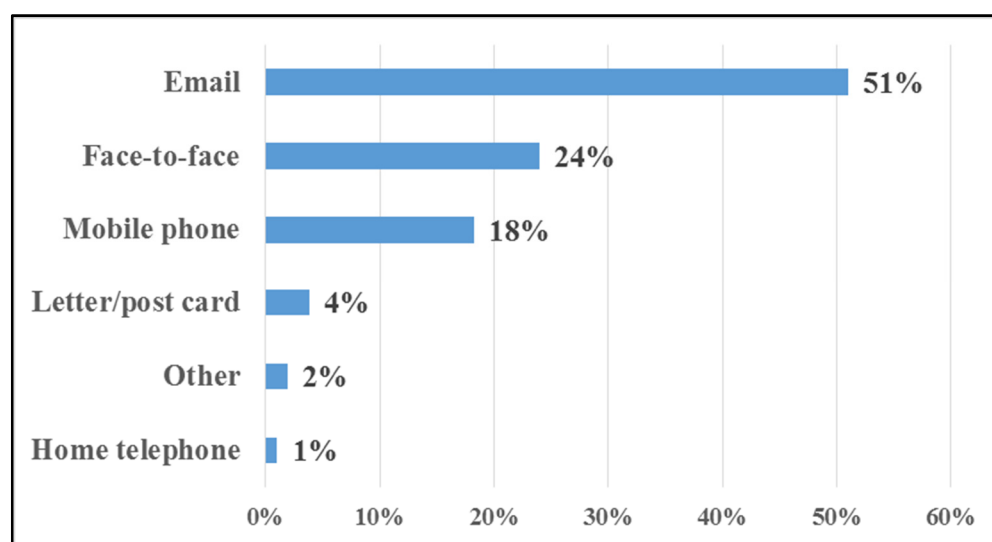
**Figure 4.8: Case Study 2-When students like to be contacted? 'As soon as it occurs'**

Figure 4.9 shows the summary of responses to a multiple response question: what specific behaviours students' like to be contacted (QII.2). We noted that majority students like to be contacted for low assessment scores (24.9%), missing work (18.7%) and lack of participation/effort (14.5%).



**Figure 4.9: Case Study 2-For what specific behaviours students' like to be contacted? (QII.2) (N=67)**

In a follow-up multiple response question: how would students like to be advised about opportunities to seek assistance (QII.3) it was noted that 53 students (51%) wanted to be advised about opportunities to seek assistance via email, followed by face-to-face (25 students, 24%), and mobile/cell phone (19 students, 18.3%). Only 4 students (3.8%) wanted to be advised via letter/post card by post (snail mail) and 1 student (1%) wanted to be advised via home telephone. Figure 4.10 shows that 2 students (1.9%) reported 'Other, please specify' that he/she would like to be informed about opportunities to seek assistance via 'one-time text' and 'in-class announcements'.



**Figure 4.10: Case Study 2-How students want the alerts to take? (QII.3) (N=65)**

In another multiple response question about student preferences for seeking help (QII.4), 67 unique participants responded with a total of 259 responses, since they

were allowed to choose more than one option, this number is larger than the number of participants (N=67). The following results are based on the number of responses. Fifty-one students (19.7%) preferred *talking with the unit teaching staff to work out a plan to improve their grade*; 36 students (13.9%) preferred *meeting with a tutor(s)*; 34 students (13.1%) said they preferred to *receive a written plan from the unit convenor/lecturer*; 27 students (10.4%) said that they can *manage themselves*; 24 students (9.3%) think *getting an email/letter about how they are doing in a class* is enough; 22 students (8.5%) think *talking with a counsellor/support services about how to work through their problems* is sufficient; 20 students (7.7%) said *attending a workshop/seminar and meeting with other students to form a study group* would motivate them to seek help; followed by 13 students (5%) said *getting a phone call from unit convenor/lecturer*; and 12 students (4.6%) preferred *actively participating in discussion forums to get information from the unit teaching staff and other students on how to improve* would motivate them to seek help. Therefore, the results suggest that most activities requiring a student to interact with his/her instructor will improve their academic performance. The totals do not add to N=67 as the participants could check all or no checkboxes.

Participants were allowed to select all that apply when answering why they chose to enrol in their current institution (QIII.1) (N=69). ‘Program of study choices’ (32.2%) and ‘good reputation’ (22.6%) were the most often selected followed by ‘proximity to home’ (11.6%) and ‘the only university I got accepted’ (11.6%).

Section III aimed to understand student awareness of university support services and whether they would prefer to have access to a small document such as learning support guide other than unit guide that outlines the support services available, expectations of students, and processes at the university. Of the 69 respondents, 56 students (81.2%) said that they were not aware of the available university support services. Only 13 students (18.8%) were aware of the available support services (QIII.2). They were asked to name at least three (3) support services they are aware of in a free text entry. We performed some pre-processing on the data and considered the frequency of term usage. For a better visual representation to display terms in varying sizes according to their frequency we have used Wordle™ available at <http://www.wordle.net/> to create a word cloud (Figure 4.11). We can

see that students were most aware of campus wellbeing and counselling, followed by services related to health, study skills and employment.



**Figure 4.11: Case Study 2-Word Cloud for university support services students were aware of (QIII.2)**

A total of 12 (17.6%) students said they were currently taking advantage of university support services and 56 students (82.4%) said that they were not taking advantage of any university support services (QIII.3). Over three quarters of students (56, 82.4%) said that they would like to have access to a learning support guide other than unit guide. Only 12 students (17.6%) responded that they do not need any such document (QIII.4).

Section IV aimed to identify unit specific learning and teaching factors that influence why the student chose to study at that institution. Of the 78 respondents (section 4), 48 students (61.5%) were studying 4 units followed by 16 students (20.5%) studying 3 units, 9 students (11.5%) taking 2 units and only 5 students (6.4%) were doing a single unit (QIV.1). Based on the entry in QIV.1 students were asked to enter the unit ID (QIV.2) for each unit they studied in S1 2014 followed by unit specific questions (QIV.3-IV.14). For this case study, the analyses of the questions (QIV.3-IV.14) are reported only for COMP1XX (43 students), PHYS1XX (17 students) and MATH1XX (15 students). To present the total numbers, the results for COMP1XX are presented first, followed by results for PHYS1XX and MATH1XX. A total of 39, 15, and 14 are doing these units for the first time; 4, 2, and 1 were repeating students (QIV.3). In addition, 8, 9, and 11 students said they had the prior knowledge of the unit and 34, 8, and 4 don't (QIV.4). For QIV.5, 37, 16, and 13 students had read the unit guide and 6 from COMP1XX, 1 from PHYS1XX, and 2 from MATH1XX had not. Some comments from students for why they have not read the unit guide were 'not bothered', 'was

not compulsory to read’ and ‘too long’. A total of 29, 10, and 11 said that they completely understand the unit requirements; 14, 7, and 4 partially (QIV.6).

Table 4.13 shows the means and standard deviations of the abilities and skills of students based on a 5 point Likert scale being 1 (not competent), 2 (somewhat competent), 3 (uncertain), 4 (competent) and 5 (highly competent) (QIV.7). We noted that students from the three units have multiple abilities and skills to undertake the respective units.

**Table 4.13: Case Study 2-Mean and Standard Deviation (SD) values for student skills and abilities (QIV.7) (N=67 except for Programming ability and Interpersonal skills where N=66)**

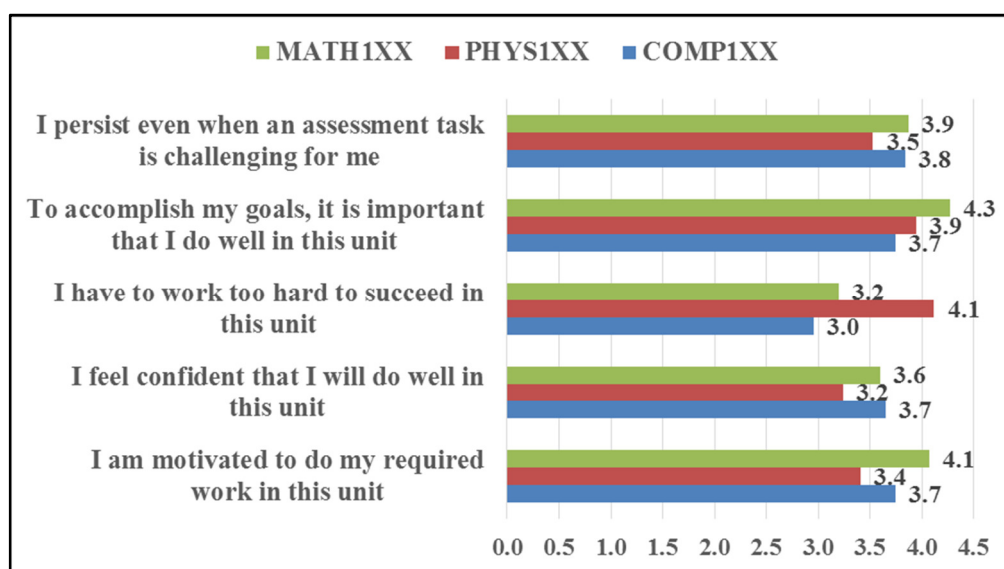
Student abilities and skills	COMP1XX		PHYS1XX		MATH1XX	
	Mean	SD	Mean	SD	Mean	SD
Academic ability	4.0	0.83	3.9	0.70	4.4	0.63
Competitiveness	3.5	1.10	3.6	0.79	4.0	1.00
Computer skills	4.0	0.84	3.8	0.64	3.5	1.19
Problem solving skills	3.9	0.91	4.0	0.50	4.4	0.63
Programming ability	3.3	1.12	3.2	0.83	3.1	1.19
Critical thinking skills	3.9	0.81	4.2	0.44	4.2	0.68
Interpersonal skills	3.7	0.89	3.8	0.81	3.3	1.23
Ability to manage my time	3.0	1.13	3.4	1.17	3.4	1.12

Respondents were asked about the unit preparedness (QIV.8); 26%, 65%, and 60% students said that they were quite well prepared to undertake this unit, 26%, 24%, and 20% said fairly well, 26%, 6%, and 13% said very well and 2% in COMP1XX said unsure and 19%, 6%, and 7% said they were very little prepared to undertake this unit. For QIV.9, a total of 9, 5, and 5 students had experience in the subject content(s) outside the unit and 34, 12, and, 10 had not. Reasons shared in the ‘Other, please specify’ comments were, ‘already an experienced programmer’, ‘HSC experience’ and ‘experience from previous degree’.

QIV.10 was a multiple response question, respondents were asked to select all that apply when conveying the reason(s) for why they are taking this unit. For COMP1XX (N=43), *degree requirement* (36/43) was the most often selected followed by *want to learn more about the subject content* (14/43). One student selected “Other, please specify” and gave the reason for taking this unit as “curiosity, interest and for variety”. Similarly, for PHYS1XX (N=17), *degree requirement* (15/17) was the most often selected followed by *want to learn more about the subject content* (5/17). One student selected ‘Other, please specify’ and gave the reason for taking this unit as ‘...forced to take’. Alike for MATH1XX

(N=15), *degree requirement* (13/15) was the most often selected followed by *want to learn more about the subject content* (9/15). Therefore, we noted that all three units are compulsory units for the students, at least for the respondents.

The results to QIV.11 regarding the motivation in the unit shows that the average motivation of students ranged from 3.0 - 4.3 out of a maximum 5 for COMP1XX, PHYS1XX, and MATH1XX respectively (Figure 4.12).



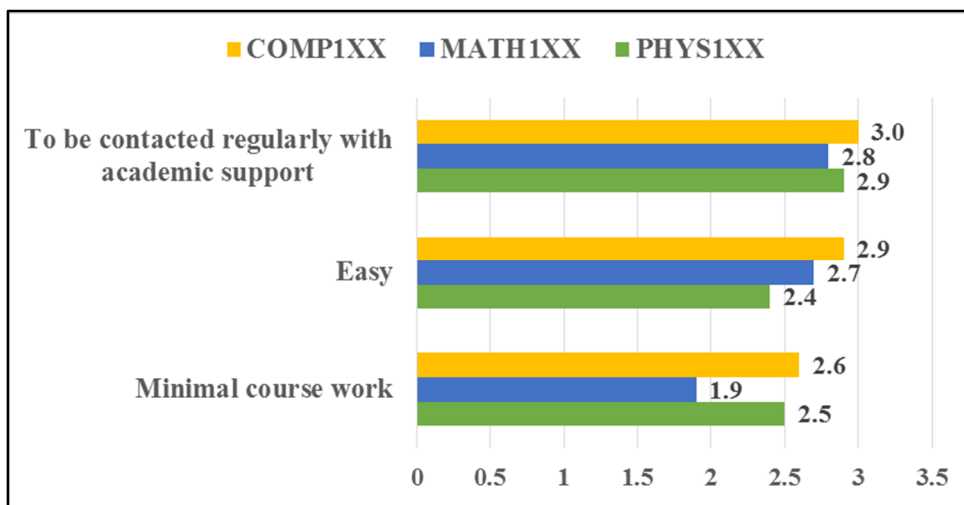
**Figure 4.12: Case Study 2-Student Motivation**

A total of 24, 9, and 12 students thought there are factors that may affect their academic performance in the unit (QIV.12). Those students who marked “yes” were further asked to report the factors which can affect their academic performance in the respective unit (Table 4.14). Reasons shared in the ‘Other, please specify’ comments were ‘carer’, ‘medical reasons’ and ‘sports’.

**Table 4.14: Case Study 2-Factors affecting student performance in the respective unit (QIV.12)**

<b>Factors</b>	<b>COMP1XX</b>	<b>PHYS1XX</b>	<b>MATH1XX</b>
Family responsibility/commitments	16%	29%	40%
Emotional health	37%	47%	60%
Physical health	14%	6%	20%
Financial issues	12%	18%	33%
Felt under-prepared for this unit	9%	12%	20%
Communication skills	9%	0%	7%
Issue with the teaching staff	0%	0%	7%
Lack of student academic support	5%	6%	13%
Religious commitments/activities	0%	0%	0%
Social coping skills	5%	12%	13%
Problems with daily travel	12%	29%	20%
Paid work commitments	16%	0%	20%
Other	9%	0%	13%

Figure 4.13 shows the means for the results regarding the expectations of the unit (QIV.13) for three units. At the beginning of the semester, more students expected the unit(s) to be easier and have minimal coursework.



**Figure 4.13: Case Study 2-Student Expectations (QIV.13)**

Figure 4.14 shows the means for the results to QIV.14 regarding the expectation(s) from the teaching staff in the respective units such as teaching staff are approachable and available to give feedback.

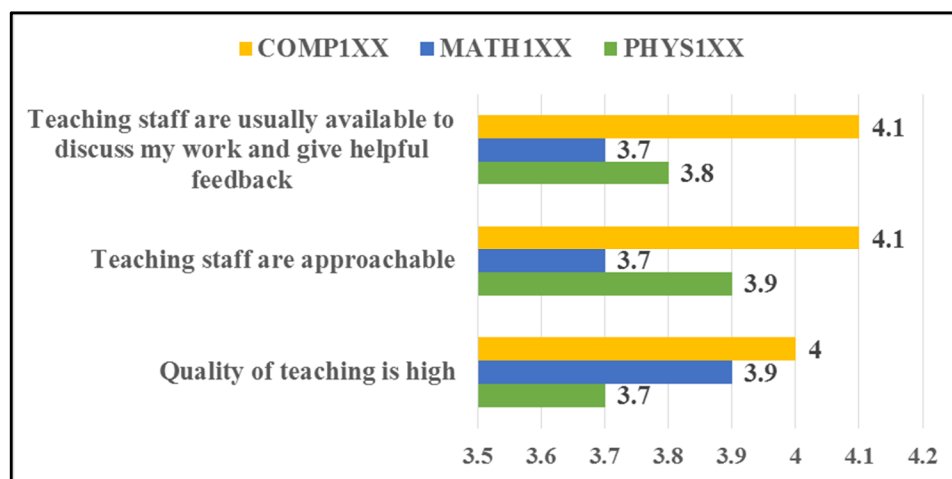


Figure 4.14: Case Study 2-Student Expectations from the teaching staff (QIV.14)

### 4.6.3 Summary and Reflections from the Case Study 2

The main purpose to conduct Case Study 2 was to widen the distribution of the survey, specifically targeting high-risk units in the Faculty of Science and Engineering (FoSE). The Case Study 2 was requested by the FoSE Academic Standards and Quality Committee to determine the value of early alerts in future offerings of the units. It is important to note that only the *Initial* survey was sent at the end of the semester and no interventions were done.

For the analysis of the demographics (section I), students in COMP1XX, PHYS1XX and MATH1XX are not separated out because all students are from first year units within FoSE and student characteristics in each group are very similar (i.e. younger school leavers with similar gender distribution and working hours).

In order to answer our research question about opinions and preferences of students with respect to early alerts, it is interesting to note that the majority of students (90%) from the three units want to be contacted if their performance in the respective unit is unsatisfactory. They want to be contacted as soon as it occurs (34.7%), before the HECS census date (18.1%) or the first time it occurs (17.4%); for low assessment scores (24.9%) followed by missing work (18.7%) and lack of participation (14.5%); and they want to be contacted via email (51%) rather than face-to-face, phone call or letter/post card.

Concerning the skills and abilities (QIV.7) and motivation of students (QIV.11), students from MATH1XX have better self-reported academic ability, competitiveness and problem solving skills and motivation in the unit. However,

the students from all the three units have similar interpersonal skills; time management skills; and programming abilities.

Students from MATH1XX have more factors affecting their academic performances (QIV.12). However, factors such as, family responsibilities, financial issues, felt under-prepared for the unit, lack of academic support, physical and emotional health issues are more likely to affect the MATH 1XX students rather than COMP1XX and PHYS1XX students who feel that they have lack of communication and social coping skills, and problems with daily travel.

In view of these initial positive findings it would be highly beneficial to redefine the target population to include other faculties across the university. Furthermore, it was important to collect data in the context of an automated alert system, rather than continue with the limited manual approach used in the pilot and case study 1. The interest and assistance of staff in the Learning and Teaching Centre was investigated so that a Teaching Development Grant Proposal can be submitted together to obtain funding to build a prototype student early alert system, gain wider support and buy-in and widen involvement.

#### **4.7 Case Study 3: Session 1 (March 2015-June 2015)**

The Teaching Development Grant Proposal submitted at the end of 2014 was successful. This enabled programming to commence on MEAP and establishment of a development version of our current LMS running on a parallel test server and recruitment of unit convenors across the institution. Case study 3 was conducted in session 1 (standard 13 weeks' session) from March 2015-June 2015. The sample for this study included participants from 13 undergraduate units representing all four faculties: Arts (7), Humanities (1), Business (1), and Science (4) units. These units were selected because of the perceived benefits of automated support, with a large enrolment (at least 100+ students) and with a large number of students that historically have not completed/passed (at least 10% of enrolments). We include here the failure rates for the three units on board offered within our department as we do not have access to failure rates in units outside our department (COMP1XX = 32%; COMP2XA = 18%; and COMP2XB = 26%). This is to ensure that there is sufficient data to demonstrate benefits of using MEAP+. Again, attention was paid that the selected units should have online activities in iLearn, including forum posts

and online assessment and learning tasks such as quizzes. This is to ensure that students spend time in iLearn and complete a number of tasks so that the MEAP+ can collect sufficient data on student activity to generate a value for the level of engagement.

#### **4.7.1 Design and Procedure of Case Study 3**

The student surveys were open to all students enrolled in the 13 units on board. The participants were initially invited by the unit convenor by posting an invitation message on the news forum of the respective unit iLearn pages to fill in an *Initial* online questionnaire during week 3 of the semester. In our institutional LMS, students received the announcements in their university email. The survey structure and questions used in case study 3 was quite similar to the one used in case study 1 and 2 with minor modifications in the question options. Two new questions were added regarding to seek permission to access student data held by the university to be used to identify and send early alerts about their performance.

The *Initial* survey contained four sections. Section I collected student demographic information including an identifier (Student ID). Sections II and III gathered unit specific information and early alert related questions, respectively. Section IV gathered institutional factors. Again, because of the low response rate to the *Initial* survey, the unit convenors were requested to put up an invitation for the survey (a new version including questions from both week 3 and week 12 surveys) on the top of the unit iLearn page in week 12 to the same cohort. Students completed the questionnaire on an entirely voluntary basis. MEAP+ was used to send the alerts (chapter 3). Descriptive statistical analysis was done using the SPSS version 23.0. The next section presents the results.

### **4.7.2 Results of Case Study 3**

The results presented below are received from 12 units. From one unit, no response was received at all. From the 12 units 1,301 students agreed to participate by checking the information and consent statement radio button. After screening for usability and reliability, 1,113 responses were found to be complete and usable. If we define the completion rate as the ratio of the number of surveys completed to the number of surveys started following consent, we found a survey completion rate of 85.5%.

Section I collected student demographic information including an identifier (Student ID) so that we can match their achievement in the unit from another database. Table 4.15 presents the selected demographic attributes of the participants.

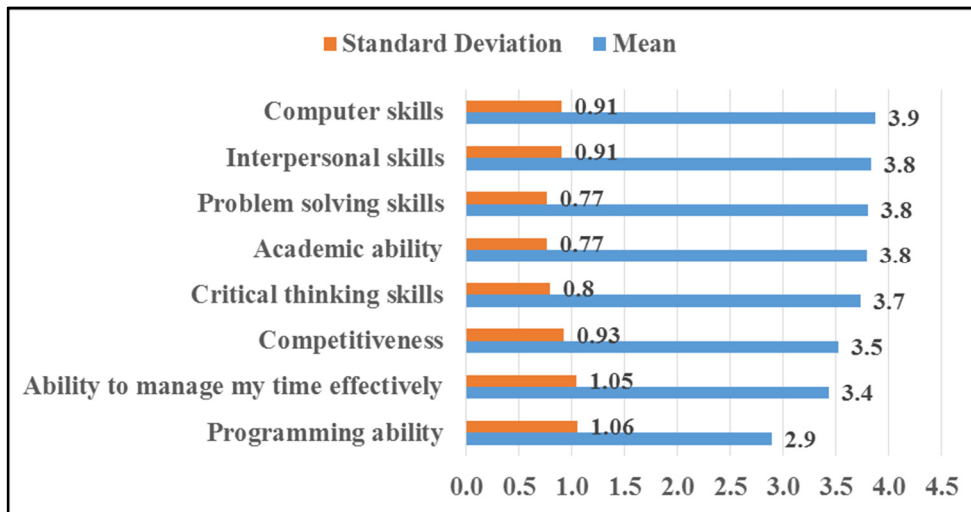
**Table 4.15: Case Study 3-Student Demographics**

<b>Basic Demographics</b>	<b>Respondents</b>	
	<b>N</b>	<b>%</b>
Number of respondents	<u>1113</u>	
Gender		
Male	330	30.2
Female	753	68.9
I don't identify as male or female	10	0.9
Age (years)		
18 or younger	473	42.6
19-24	482	43.4
25-34	83	7.5
35-49	48	4.3
50 or older	24	2.2
Prefer not to say	1	0.1
First Language		
English	926	83.6
Other than English	182	16.4
Ethnicity		
International Student	76	6.9
Aboriginal/Torres Strait Islander Student	9	0.8
Neither	1023	92.3
Student Status		
1 <sup>st</sup> year, 1 <sup>st</sup> semester student in S1-2015	690	62.0
I came from another university in S1-2015	46	4.1
1 <sup>st</sup> year student, 2 <sup>nd</sup> semester student in S1-2015	55	4.9
2 <sup>nd</sup> year student	181	16.3
3 <sup>rd</sup> year student	79	7.1
Other	62	5.6
Faculty		
Arts	306	27.5
Business and Economics	281	25.2
Human Sciences	337	30.3
Science and Engineering	189	17.0
Other Responsibilities		
Yes	180	16.3
No	925	83.7
Employment (Hours)		
< 5	118	10.6
5-10	198	17.8
11-15	186	16.7
16-20	146	13.1
> 20	159	14.3
Not working	305	27.4
Physical Disability		
Yes	47	4.2
No	1065	95.8

*Note:* Totals for a particular demographic question do not add to 1113 as of missing values

In Section II QII.1 (N=1006), 958 students were doing the unit for the first time (95.2%); 48 were repeating students (4.8%). For QII.2 (N=1045), 185 students (17.7%) said they have prior knowledge of the unit and 860 (82.3%) don't (QII.2). In a following question QII.3 (N=1046), 989 students (94.6%) had read the unit guide and 57 (5.4%) had not; 648 (62.1%) said that they completely understood the unit requirements, 351 (33.7%) partially and 44 (4.2%) did not (QII.4).

Figure 4.15 is the bar chart showing means and standard deviations of the abilities and skills of students (QII.5) where they had chosen the following traits between 1 (not competent), 2 (somewhat competent), 3 (uncertain), 4 (competent) and 5 (highly competent).



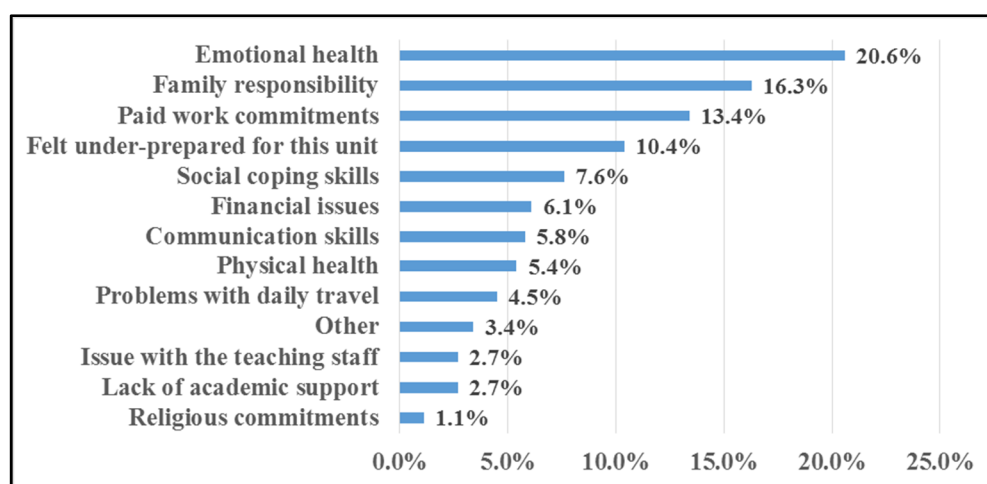
**Figure 4.15: Case Study 3 Study- Mean and Standard Deviation values for student skills and abilities (QII.5) (N=1006 except for Competitiveness & Academic ability where N=1007 and Programming ability & Time management where N=1005)**

For QII.6 (N=1006), 171 (17.0%) are very well prepared to undertake this unit; 431 students said that they are quite well prepared to undertake this unit (42.8%); 312 said fairly well (31.0%); 70 said very little (7.0%); 6 said they are not prepared (0.6%) and 16 said unsure (1.6%). For QII.7 (N=1004) from the respondents, majority students (842, 83.9%) had no experience outside this unit and less than a quarter of the respondents (162, 16.1%) had the programming experience. In answer to QII.8 (N=1003), 761 were taking the unit as degree requirement (54.9%); 444 want to learn more about the unit content (32.0%); 142 students were taking the unit as a Planet Unit (10.2%); 4 students were taking the unit as a PACE Unit (0.3%); and 35 students (2.5%) mentioned Others (e.g. as an elective unit and as

part of pathway subjects). The totals do not add to N as it is a multiple response question and the participants could check all or no checkboxes.

For QII.9 (a Likert scale question) the values are presented as mean (standard deviation). Motivation in the unit was 3.9 (0.97) (N=1002); regarding confidence levels to do well in the unit was 3.4 (0.92) (N=1001); 3.4 (1.14) would have to work too hard (N=999); 4.12 (0.87) will accomplish goals (N=1002); 4.13 (0.84) persist even when an assessment task is challenging for them (the students) (N=1000). In a following question regarding if there are factors that may affect their academic performance in the unit, 441 students (68.1%) thought there are factors that may affect their academic performance in a unit and 207 students (31.9%) thought there were not (QII.10a) (N=648).

Figure 4.16 is the bar chart showing percentages for possible obstacles that may affect students' academic performance (QII.10b).



**Table 4.16: Case Study 3-Factors that can affect students' academic performance (QII.10b, N=459)**

In QII.11 (N varies, mentioned with the item) and QII.12 (N=649) included the expectations of the respondents from the unit and the unit teaching staff respectively. Both were Likert scale questions. Students expected the unit to be easy 2.2 (1.05); involve minimal course work 2.3 (0.91); to be contacted regularly with academic support 3.6 (0.86). Expectations regarding the quality of teaching was high 4.15 (0.80); teaching staff were approachable 4.11 (0.85); and teaching staff are usually available to discuss my work and give helpful feedback 3.9 (0.90).

In a separate section, students were asked questions about their preferences to allow the possible design of ‘early alerts’ in future offerings and other units.

Table 4.17 shows the summary of responses whether a student wants to receive an early alert, when, how and in what form they want that alert to take.

**Table 4.17: Case Study 3-If, when, why and how to be sent alerts\***

Questions	N	%
<b><i>If &amp; when students like to be contacted? (N=894)</i></b>		
Want to be contacted (N=985)	890	90.4
As soon as it occurs	671	39.0
The first time it occurs	275	16.0
Following first assessment results	259	15.1
Before Census date	193	11.2
Only after it happens more than once	176	10.2
Before exclusion date	139	8.1
<b><i>For what specific behaviours students like to be contacted? (N=960)</i></b>		
Low scores in assessments	814	22.5
Compare to rest of the class	626	17.3
Missing work	540	14.9
Lack of participation/effort	414	11.4
Frequent absences	259	7.1
In-class behavioural problems	211	5.8
Lecture resources/content not viewed	192	5.3
Announcements not read	164	4.5
Not logged in to LMS for more than a week	138	3.8
No participation in forums	117	3.2
Not reading discussion posts	85	2.3
None	50	1.4
Other	13	0.4
<b><i>How would you like to be advised about opportunities to seek assistance?(N=972)</i></b>		
University email	853	47.8
Face-to-face	314	17.6
Personal email	284	15.9
Mobile phone	226	12.7
Letter/Post card	80	4.5
Home phone	19	1.1
Other	7	0.4

\* Totals do not add to N as they were multiple response questions and the participants could check all or no checkboxes

When asked about student preferences for seeking help (N=972), 641 students (18.6%) preferred to talk to the teaching staff to work out a plan to improve their grades; 523 students (15.2%) preferred to meet with the tutor/s; 513 students (14.9%) said they preferred to receive a written plan on how to improve their grade; 335 students (9.7%) indicated to meet with other students to form a study group; 327 students (9.5%) marked attending a workshop/seminar with other students; 318

students (9.35%) said that can manage themselves; 278 students (8.1%) said that getting an email/letter about how I am doing in a class is enough; 251 students (7.3%) indicated talking with a counsellor/support services will help; 130 students (3.8%) marked actively participating in discussion forums; 116 students (3.4%) getting a phone call from the unit convenor would motivate them to seek help. This question was a multiple response question so totals do not add to N as the participants could check all or no checkboxes.

For the two newly added questions regarding permission to access student data in the institution LMS or other academic data held by the university to be used to identify and send early alerts (N=985), 674 students (68.5%) agreed; 49 students (5.0%) disagreed; and 262 students (26.6%) students were unsure. In a following question to seek permission to access their demographic and academic background data to support their learning (N=985), 655 students (66.5%) agreed; 94 students (9.5%) disagreed; and 236 students (24.0%) students were unsure.

In a multiple choice question, students were asked to select all that apply when considering reason(s) for enrolling at Macquarie University (N=982); 775 said it had the program they wanted to study (36.4%); 596 selected because of good reputation (28.0%); 358 selected close to home (16.8%); 132 said that a family member attended or is attending (6.2%); 105 said it was the only university they got accepted (4.9%); and 77 said affordable (3.6%). The totals do not add to N as the participants could check all or no checkboxes.

In a following question regarding institution specific support services (N=1034), majority (773 students, 74.7%) said they were not aware of the available university support services. On the other hand, 261 students (25.3%) were aware of the available university support services and they mentioned (in an open ended question) the university services including: campus wellbeing, academic support, mentors @ Macquarie, student disability support, career hub, medical service, ask.mq.edu.au, numeracy centre, counsellor, PAL (Peer Assisted Learning) sessions, study WISE, library, online IT support, equity and diversity. For another question regarding students taking advantage of the institutions support services (N=1035), majority respondents (925 students, 89.4%) said they were not taking advantage of any university support services. Instead, only 110 students (10.6%)

were taking advantage of the university support services. In a last question for this section, majority of the respondents (832 students, 80.5%) said that it would be helpful to have access to a small document, such as a learning support guide (other than unit guide) that outlines the support services available, expectations on students and processes at the institution (N=1034).

The results from the *Follow-up* intervention questions are presented next. 55 students received the alerts. 39 of these 55 students did the *Follow-up* survey. We present their responses here. The percentage of respondents choosing each question option is written in parenthesis after the question option. If there is no value against an option, it received no responses.

*Did you follow-up or take any action as result of the early alert notice?* (Yes=70.9%, No=29.1%).

*What specific action(s) did you take when you were first contacted by an early alert notice?*

- Emailed unit convenor/lecturer and asked for more information on what to do (45.8%)
- Set an appointment for in-person meeting with my unit convenor/lecturer (22.9%)
- Got attentive and started to work seriously (14.6%)
- Other (12.5%)
- Ignored the early alert message (4.2%)

*What was your attitude towards being contacted via an early alert notice? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)?* The values are presented as Mean (Standard Deviation)

- I appreciated that there was someone watching out for me 4.0 (0.97) (N=51)
- I was grateful that somebody contacted me about my academic standing in this unit 3.9 (0.99) (N=51)
- I was glad to speak to my unit convenor/lecturer about my situation 0.3 (1.10) (N=576)

*Were you advised to seek help from any student support services?* (Yes=47.2%; No=52.8%)

*Which student support services from the campus wellbeing were you advised to visit?* The totals do not add to 100% as the participants could check all or no checkboxes.

Academic Advice (23.8%); Ask.mq.edu.au (14.3%); Counselling service (14.3%); Learning skills program (14.3%); Welfare service (financial aid services, academic progress issues) (7.9%); Numeracy centre (4.8%); Education services for overseas students (ESOS) (3.2%); Tech Help (3.2%); Financial aid services (1.6%); Career & Employment service (1.6%); Disability service (disability support unit) (1.6%); Chaplaincy service (1.6%); Health and wellbeing service

*Did the early alert notice provide you with campus student support services that you did not previously know about? (Yes=40.4%, No=59.6%)*

*What is your attitude towards campus wellbeing services at Macquarie University relevant to this unit? The totals do not add to 100% as the participants could check all or no checkboxes.*

- Student support services were available to help me (34.3%)
- The hours of operation for the student support services were convenient (23.9%)
- Student support services were able to help resolve my issue(s) (20.9%)
- Student support services provided me with the accurate information (16.4%)

*Which actions(s) were you advised to take? The totals do not add to 100% as the participants could check all or no checkboxes.*

- Speak with the unit convenor/lecturer (33.3%)
- Complete missing/Late work (assignments, quizzes/tests, weekly submissions) (20.2%)
- Listen to podcasts of lectures (16.7%)
- I did not take any action (10.7%)
- Attend lecture and tutorials/workshop (10.7%)
- Show up to lecture and workshop (tutorial and practical) on time (4.8%)

*Did you turn in missing/late work? (Yes=43.4%, No=56.6%)*

*Did you apply for Special Consideration for any assessments? (Yes=32.7%, No=67.3%)*

*Did you make up any weekly submissions? (Yes=32.1%, No=67.9%)*

*Did you get tutoring help outside the university? (Yes=5.7%, No=94.3%)*

*Did you visit a coaching centre outside the university? (Yes=5.8%, No=94.2%)*

*Did the Early Alert improve your attendance in this unit? (Yes=34.0%, No=34.0%, Unsure=32.1%)*

*Did the Early Alert improve your learning in this unit? (Yes=41.5%, No=20.8%, Unsure=37.7%)*

*What is your attitude toward interventions and academic standing in this unit? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)?*

- Now I know where to seek help for my academic studies 3.6 (0.96)
- I believe that student support services help 3.5 (1.01)
- I feel better prepared to deal with my academic situation 3.4 (0.98)

*Please indicate how you feel about your current academic standing after you were being contacted by an early alert notification?*

Much better (22.6%); somewhat better (50.9%); about the same (22.6%); somewhat worse (3.8%); much worse

*Overall, how satisfied you are with the Early Alert system?*

Completely dissatisfied; Dissatisfied (3.8%); Neutral (41.5%); Satisfied (39.6%); Completely satisfied (15.1%)

*Is there anything else you would like us to know?*

(Yes=8.8%, No=91.2%)

### **4.7.3 Summary and Reflections from the Case Study 3**

The main purpose of the case study 3 was institution-wide distribution of the survey and utilisation of Moodle Engagement Analytics Plugin (MEAP) in units that met the unit participation criteria (i.e. large enrolments, online activities in iLearn and high failure rates in the last study period). To use and test the MEAP+ to generate an engagement report to identify the students at-risk. The students' university email addresses were used to send alerts within the LMS. The *Initial* and *Follow-up* surveys were sent at two different time stamps during the semester.

For the analysis of the demographics (section I), we have more female student respondents, more first year first semester (FYFS) students who have no other responsibilities and were not working in semester 1 2015. In order to answer our research question about opinions and preferences of students with respect to early alerts, it is worth noting that the responses were in line with the case studies conducted earlier. The majority of students (90.4%) from the 12 units want to be contacted if their performance in the respective unit is unsatisfactory. They want to be contacted as soon as it occurs and/or the first time it occurs (when to be contacted), for low assessment scores followed by missing work, lack of participation and frequent absences (why to be contacted). They want to be contacted via university email, face-to-face and personal email (how to be contacted) rather than phone call or letter/post card.

## **4.8 The Final Study (Case Study 4): Session 2 (August 2015 – Nov 2015)**

The case study 4 (also called the final study) was carried out between August 2015 and November 2015. The main purpose of the case study 4 was similar to case study 3 as the institution-wide distribution of the survey and utilisation of MEAP+ in units that met the same unit participation criteria. These aims were to test the extended version of the MEAP prototype (MEAP+) to identify students at-risk and send alerts and interventions to students using the mailer component (discussed in chapter 5, section 5.3). To increase the response rates to our online survey an incentive (prize draw) was added to facilitate survey recruitment and motivate participants who might otherwise not respond. A single survey combining *Initial* and *Follow-up* questions was sent at the end of the semester.

The participants were recruited from 17 large undergraduate units (9 first-year, 7 second-year and 1 third-year), delivered in either an online or blended mode at our institution during the session 2 2015 academic term. The total undergraduate enrolment during the session 2 2015 academic semester in the participating 17 units was 7,035. These units were selected because they consisted of a range of online activities (forum discussions, quizzes and assignments) that students needed to complete in the LMS and they had a relatively high number of at-risk students in the previous three study periods (for example, the failure rate in ISYS1XX offered within our department = 21%). The sample of units for this case study included participants representing the four faculties: Arts (2), Humanities (1), Business (6), and Science (8). The fifth faculty of medicine and health sciences was formed in 2014 so for this thesis no units were selected from this faculty.

### **4.8.1 Design and Procedure of the Final Study**

The survey population were higher education under-graduate students and probably similar in their computer usage skills. In this modern era of technology, our sample provides a good setting for assessing the kinds of individuals who will choose web based questionnaire completion over a postal survey. The target users of the survey were all students enrolled in the participating units.

At the beginning of the semester, students were invited to complete a voluntary online survey using Qualtrics (qualtrics.com), with a link to the web-based survey either within the course management page or with an email. A copy of the recruitment announcement can be found in Appendix E. The unit convenors made an announcement within iLearn (LMS) to encourage participation and to improve response rate.

During the nine weeks (25-09-2015 to 30-11-2015) period of survey administration, 687 (10% of possible participants) individual student surveys were attempted by checking the information and consent statement radio button. Qualtrics (Qualtrics 2014) record this number and include responses that were submitted by the respondent and incomplete responses that were collected by the system (after the *Record Partially Completed Responses* deadline had passed). After screening for usability and reliability of the attempted surveys, 639 (93% of total responses) were deemed complete and usable, 48 (7% of total responses) were considered incomplete (41 blank, 3 test responses, 4 duplicates) and/or lacking entire survey response completion. Completion was determined and calculated by the Qualtrics online survey software based on the number of answered survey items. Upon completion of the survey period and collection of data, an analysis of the descriptive characteristics of the sample was conducted. If we define the completion rate as the ratio of the number of surveys completed to the number of surveys started (that is, agreed to participate by checking the information and consent statement radio button), we found a survey completion rate of 93% ( $639/687=93\%$ ).

The dataset for case study 4 contains 639 observations. The data set includes 190 variables related to demographics, unit specific information, opinions, and preferences of students regarding early alerts and interventions that could be nominal and ordinal. The questions for each section are provided in Appendix E. To increase the response rates to our online survey we have used a reward/incentive to facilitate survey recruitment and motivate participation among individuals who might otherwise not respond. The participants were informed in the information and consent form that if they decide to participate, at the completion of the survey they will have the opportunity to enter the draw for four \$50 JB Hi-Fi vouchers.

Pre-processing of the data, descriptive statistics and an exploratory analysis were performed in SPSS 23.0 and Microsoft Excel. For some questions, participants only

marked a response if it was applicable to them, if not, it was considered '0' which means they did not mark the respective response option from the given ones, since they are not applicable to them. Due to the cross-sectional nature of the survey instrument, survey responses were analysed to shed light to student perspectives related to early alert systems. Multiple demographic characteristics, including student number, unit code, gender, age, ethnicity, student status, and employment hours were considered. If a student actually receives an early alert, statistical analysis was conducted to determine: the attitude of students receiving an early alert/intervention; change in the behaviour for how they studied for a unit; motivation to continue in the unit; and motivation to utilise the campus student support services.

Demographic information reported by participants were analysed and reported. Information including students' gender, age, and ethnicity, enrolment by course load, student status, and employment hours were examined through data analysis to investigate any correlations, trends, and significant differences. Descriptive and frequency analyses were included to examine the overall survey population, including the representation of subcategories, mean, standard deviation, and other descriptive statistics, if relevant.

Descriptive statistics were generated for each item on the survey instrument. These descriptive statistics included the mean scores and frequency distributions of student responses. Statistical methods such as chi-square test for cross tabulations were used to test associations between different variables. Where applicable, a Pearson Correlation Coefficient is also used to investigate the correlation between different variables. The choice of the statistical methods will be justified and methods will be described preceding presentation of the results. A p-value of 0.05 was used to determine statistical significance for all applicable tests conducted.

#### **4.8.2 Non-Response Bias**

One way of reaching more people is through using an online or web-based survey, which is more cost effective compared to other methods of data collection. For this research, we look at non-response bias in two steps. First is the *amount of non-response* and second is the *bias*. Bias is the difference between a survey estimate and the actual population value (between the respondents and non-respondents).

Population characteristics = respondents' characteristics +/- non-response bias

Our aim is to minimise non-response bias as much as possible to achieve a representative sample. In other words, if the non-response bias is equal to zero then our sample is representative of the population. Evaluation of the bias is not always possible as the true value of the population or population characteristics are not known. Wherever a true population value is known, the difference between the value computed from the survey data and the true population value can be considered an estimate of the bias related to the survey estimate.

The underlying assumption is that every subject in the study population has a position on the response continuum that ranges from 'will never respond' to 'will always respond'. Non-respondents will be determined on the side of 'will never respond'. Subjects who require more reminders/time before they participate would have been non-respondents if the data collection had finished before they responded. Therefore, late respondents most resemble non-respondents and late respondents can be used as a proxy for non-respondents in estimating non-response bias.

For this case study, we have used the *Wave Analysis* technique to evaluate the non-response bias. We have chosen the Wave Analysis technique because it is: (1) a widely used method (2) inexpensive (3) less time consuming (4) low in data requirements (5) reasonable and coherent within our case study context.

Wave analysis technique is also called the Linear Extrapolation Method (Armstrong & Overton 1977). The extrapolation method is based on the assumption that subjects (persons contacted through the survey) who respond less readily are more like non-respondents. Less readily has been defined as answering later. Armstrong and Overton (1977) suggests three different types of extrapolations within the linear extrapolation method such as successive waves, time trends and concurrent waves.

The technique that best fits our case study is extrapolation carried over time trends of the questionnaire. Persons responding later are assumed to be more similar to non-respondents. The method of time trends has an advantage over the use of waves in that the possibility of a bias being introduced by the stimulus (sending a reminder) itself can be eliminated. To measure the time from the respondent's

awareness of the questionnaire until completion, we assume the cut-off date when the responses fall below 10 per day.

The survey was administered for nine weeks from 25-09-2015 to 30-11-2015. For this case study, there were three-time trend periods:

- Time Trend 1: The availability of the online questionnaire accompanied by an information and consent form till the date before the first response was received (25-09-2015 to 26-10-2015)
- Time Trend 2: The date the first response was received till the date responses were  $\geq 10$  (27-10-2015 to 12-11-2015)
- Time Trend 3: The date the responses fall below 10 (13-11-2015 to 22-11-2015).

The following Table 4.18 shows the three time trends of survey completion.

**Table 4.18: Time trends of responses and cumulative responses**

<b>Time Trends (Dates)</b>	<b># of responses</b>	<b>Cumulative response</b>
25-09-2015 to 26-10-2015	0	0
27-10-2015 to 12-11-2015	615	615
13-11-2015 to 22-11-2015	24	<u>639</u>
Total	639	639

Now, according to our assumption for this study, we have 2 time trends on our respondents that is; time trend 1=respondents and time trend 2=late respondents/non-respondents.

The descriptive statistics of the unit-wise student demographics are provided in Appendix E; however, we are unable to confirm or deny that this sample is a representative of the population since we do not have access to population data.

The responses received before and after the cut-off date were compared in Table 4.19 based on three demographic variables: gender (male/female), domestic or international student and enrolment status (full-time and part-time). Differences in the time trends were analysed. Statistical significance was estimated by chi-square tests.

**Table 4.19: Comparison of Early Respondents and late respondents/Non-Respondents**

	<b>Early respondents Time trend 1 (N=615)</b>	<b>% of Time trend 1</b>	<b>Late respondents Time trend 2 (N=24)</b>	<b>% of Time trend 2</b>
Gender				
Female	294	47.8	9	37.5
Male	317	51.5	15	62.5
I don't identify as male or female	4	0.7	0	0
Domestic or International student				
Domestic	530	86.2	19	79.2
International	80	13.0	5	20.8
Aboriginal	5	0.8	0	0
Enrolment Status				
Full-time	569	92.5	24	100
Part-time	46	7.5	0	0

The gender (chi-square = 1.04, degree of freedom = 1, p-value = 0.306) and the domestic or international student (chi-square = 1.18, degree of freedom = 1, p-value = 0.276) of the early and late respondents in our survey are not statistically significantly different from each other.

The results from all the survey sections are presented next.

### **4.8.3 Results from the Final Study**

#### **4.8.3.1 Student Demographics**

The descriptive and frequency statistics included responses from 639 undergraduate students enrolled at Macquarie during the 2015 academic semester 2. The initial data analysis included overall and sub-categorical representation.

Section one collects student demographic information including an identifier (Student ID) and the unit code for which the student is filling in the survey. It is important for us to obtain this identifier so that we can match their achievement in the unit from the student information system database. Table 4.20 shows the responses from the 17 individual units representing various disciplines from the four faculties such as engineering, information systems, physics, accounting, finance, economics, history, international studies and academic communication unit.

**Table 4.20: Final Study-Student Responses Unit Wise**

S#	Unit Code	Department	Initial Responses	Blank/ Test/ Duplicate	Valid Responses
<b>Faculty of Science and Engineering (FoSE)</b>					<b>186</b>
1	ENGG1XX	Engineering	49	2	47
2	ISYS1XX	Computing	82	7	75
3	ISYS3XX	Computing	20	2	18
4	MECH2XA	Engineering	9	1	8
5	MECH2XB	Engineering	13	1	10
6	MECH2XC	Engineering	8	1	8
7	MECH2XD	Engineering	11	1	11
8	PHYS2XX	Physics	9	0	9
<b>Faculty of Business and Economics (FoBE)</b>					<b>297</b>
1	ACCG1XX	Accounting	27	2	25
2	ACCG2XX	Accounting	18	2	16
3	ACST1XX	Finance	121	10	111
4	AFIN2XX	Finance	48	7	41
5	ECON1XA	Economics	44	2	40
6	ECON1XB	Economics	67	5	64
<b>Faculty of Arts (FoA)</b>					<b>150</b>
1	AHIS1XX	History	113	2	111
2	EUL1XX	International Studies	40	1	39
<b>Faculty of Human Sciences (FoHS)</b>					<b>6</b>
1	ACBE1XX	Linguistics	8	2	6
<b>Total (17 units)</b>					<b>639</b>

Survey participants were asked to self-report demographic information including gender, age, and ethnicity, enrolment by course load, student status, and employment hours. A detailed analysis of the unit-wise student demographics (Appendix E) shows that the students studying units in different faculties are representative of the population. Table 4.21 presents the selected basic demographic attributes of participants. Of the total 607 respondents, 334 self-reported that they were male (52.3%) and 302 self-reported that they were female (47.3%). The most frequently reported age was 19-24 (69.3%). It was noted that the gender distribution was similar in each unit where most participants were young (between the ages of 19-24) as expected.

**Table 4.21: Final Study-Student Demographics**

<b>Basic Demographics</b>	<b>Respondents</b>	
	<b>N</b>	<b>%</b>
Number of respondents	<b>607</b>	
Number of valid responses	<b>639</b>	
Gender		
Male	334	52.3
Female	302	47.3
I don't identify as male or female	3	0.5
Age (years)		
18 or younger	157	24.6
19-24	443	69.3
25-34	30	4.7
35-49	6	0.9
50 or older	3	0.5
First Language		
English	474	74.2
Other than English	165	25.8
Ethnicity		
International Student	85	13.3
Aboriginal/Torres Strait Islander Student	5	0.8
Neither	549	85.9
Enrolment Status		
Full-time	594	93.0
Part-time	45	7.0
Student Status		
1 <sup>st</sup> year student, 1 <sup>st</sup> semester student	77	11.1
1 <sup>st</sup> year student, 2 <sup>nd</sup> semester student	321	46.8
Continuing student (2 <sup>nd</sup> year, 3 <sup>rd</sup> year or above)	236	34.4
I came from another university	47	6.9
Other	5	0.7
Employment (Hours)		
< 5	53	8.3
5-10	98	15.3
11-15	107	16.7
16-20	107	16.7
> 20	100	15.6
Not working	174	27.2

*Note:* Totals for a particular demographic question may do not add to 639 as of missing values

Cross tabulation analysis of the data was included to provide a detailed perspective on the sample for this study. Demographics of participants were presented by frequencies and percentages by their gender (Table 4.22) which highlights interconnectivity of gender, ethnicity and student status.

**Table 4.22: Final Study-Frequencies and Percentages of Participants' Demographics**

<b>Demographic characteristic</b>	<b>Males</b>	<b>%</b>	<b>Females</b>	<b>%</b>
Ethnic Background				
International Student	38	11.4	47	15.6
Aboriginal/Torres Strait Islander Student	3	0.9	1	0.3
Neither	293	87.7	254	66.7
Student Status				
1 <sup>st</sup> year student, 1 <sup>st</sup> semester student	44	57.1	33	42.9
1 <sup>st</sup> year student, 2 <sup>nd</sup> semester student	156	48.6	163	0.6
Continuing student (2 <sup>nd</sup> year, 3 <sup>rd</sup> year or above)	134	56.8	102	43.2
I came from another university	21	44.7	26	55.3

In regards to the employment hours, all students entered an answer on the survey for their self-reported employment hours. It was interesting to note that more than a quarter of the participants were not working. The mean and standard deviation of self-reported employment hours was 3.98 and 1.66, respectively (N=639). These are representative and consistent with traditional higher education enrolments at Macquarie and nationally. According to the Australian Bureau Statistics (ABS) 2012 survey of Work and Education<sup>27</sup>, many students work while studying. There could be different reasons for this such as it may be due to their financial circumstances or to gain work experience before starting their career. The majority younger students (90%) were studying full-time in 2012, compared with less than half (42%) of older students. It can be concluded that younger students were more likely to study full-time and work part-time or not work at all. On the other hand, older students were more likely to study part-time and work full or part-time.

#### **4.8.3.2 Opinions and Preferences of Students with Respect to Early Alerts**

This section is designed to investigate the first research question proposed in chapter one that sought to explore student preferences to allow possible design of alerts in future offerings and other units. This section contains questions such as whether a student wants to receive an early alert, when, how and in what form they want that alert to take. In addition, it also contains questions around permission to access student demographic and academic data held by university in LMS or other systems to be used to identify and send early alerts about their performance.

<sup>27</sup> <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20July+2013>

#### **4.8.3.2.1 *Would students like to be contacted if their performance in the unit is unsatisfactory?***

Of the 639 respondents, 637 responded to this question (N=637). 506 students (79.4%) want to be contacted if their performance in the respective unit is unsatisfactory. Only 131 students (20.6%) would not like to be contacted.

The association between the student demographics (gender, age, first language, ethnic background, enrolment status and employment status-hours per week) and liking to be contacted was evaluated using a chi-square tests. For these statistical analysis, adjustments to number of categories had been made to meet the assumption(s) (for example strongly agreed and agreed might have been merged into one category). We found no statistically significant association between student demographics and the dependent variable 'like to be contacted' (all p-values were above 0.05).

We did check the association between liking to be contacted and the student skills/abilities; motivation in the unit; attitude towards being contacted; attitude towards intervention and academic standing; and intervention impact on how the student view the unit convenor. The association was evaluated using chi-square tests. For statistical analysis, adjustments to number of categories had been made to meet the assumption (for example strongly agreed and agreed might have been merged into one category). We found no statistically significant association between the listed constructs and the dependent variable 'like to be contacted'. Either the p-values were above 0.05 or the assumptions of chi-square test were not satisfied. Where the assumption was not satisfied, we were unable to test whether there was a statistically significant association or not between these variables and *like to be contacted*. A bigger sample size might possibly help to produce results in the future.

#### **4.8.3.2.2 *When students like to be contacted?***

Those students who marked 'Yes' were further asked to report when they like to be contacted if their performance is unsatisfactory in a multiple response question based on 'mark all that apply', N=506. Table 4.23 shows the responses when students like to be contacted if their performance is unsatisfactory. As soon as it occurs and before the Census date was the most often selected.

**Table 4.23: Final Study-When students like to be contacted\***

Description		N	%
When like to be contacted?	As soon it occurs	326	20.6
	Before Census date	230	14.6
	The first time it occurs	138	8.7
	Following first assessment results	136	8.6
	Before Exclusion date	123	7.8
	Only after it happens more than once	119	7.5
	Other	2	0.1
Did not answer		151	

\* Totals do not add to N as they were multiple response questions and the participants could check all or no checkboxes

Table 4.23 lists the selections from most to least common.

#### **4.8.3.2.3 For what specific behaviours students like to be contacted?**

In a following multiple response question for what specific behaviours students wanted to be contacted based on ‘mark all that apply’, N=607. Table 4.24 shows the responses for what specific behaviours students want to be contacted if their academic performance is unsatisfactory.

**Table 4.24: Final Study-For what specific behaviours students want to be contacted\***

Description		N	%
For what specific behaviours students want to be contacted	Low scores in assessments	438	18.1
	Performance compared to the rest of the class?	383	15.8
	Missing work	348	14.4
	Lack of participation/effort	271	11.2
	Plagiarism	207	8.5
	Frequent absences	187	7.7
	In-class behavioural problems	130	5.4
	Announcements not read	127	5.2
	Lecture content/resources not viewed	115	4.7
	Not logged into LMS for more than a week	77	3.2
	Discussion postings not read	55	2.3
	No participation in discussion forums	49	2.0
	None	34	1.4
	Other	4	0.2
Did not answer		32	

\* Totals do not add to N as they were multiple response questions and the participants could check all or no checkboxes

Low scores in assessment, performance compared to rest of the class and for missing work were the most often selected. Table 4.24 lists the selections from most to least common.

#### 4.8.3.2.4 *In the future, how would you like to be advised about opportunities to seek assistance?*

In another multiple response question students were asked to select ‘mark all that apply’, when asked for how would they like to be advised about opportunities to seek assistance (N=607). Table 4.25 shows that of those contacted, university email (44%) was the most wanted way to receive the alerts, followed by the face-to-face (14.4%), personal email (12.4%) and SMS (11.6%).

**Table 4.25: Final Study-How students want the alerts to take?\***

Description		N	%
How students want the alerts to take?	University Email	549	44.0
	Face-to-face	180	14.4
	Personal Email	155	12.4
	SMS	145	11.6
	Mobile phone	101	8.1
	Social networks	57	4.6
	Letter/post card	54	4.3
	Other	5	0.4
	Home telephone	2	0.2
Did not answer		32	

\*Totals do not add to N as they were multiple response questions and the participants could check all or no checkboxes

Table 4.25 lists the selections from most to least common.

#### 4.8.3.2.5 *From the following strategies, which do you think would motivate you to seek help?*

In another question, survey respondents were asked to ‘select all that apply’, when asked for preferences for seeking help (N=607). Table 4.26 shows that of those contacted, talking with the teaching staff to work out a plan (21.8%) and receiving a specific written plan on how to improve grade (17.5%) was the most preferred ways for seeking help.

**Table 4.26: Final Study-Students' preferences for seeking help\***

Description		N	%
Which strategy would motivate you to seek help?	Talking with the teaching staff to work out a plan to improve my grade	421	21.8
	Receiving a specific written plan on how to improve my grade	338	17.5
	Attending a workshop/seminars with other students to go over improvement strategies	214	11.1
	Talking with a counsellor/support services about how to work through my problems	203	10.5
	Manage myself	202	10.5
	Getting an email/letter about how I am doing in a class is enough	202	10.5
	Meeting with other students that are also having problems in the class to form a study group	198	10.2
	Actively participating in forums	81	4.2
	Getting a phone call from the teaching staff to help me work through my options	69	3.6
	Other	4	0.2
Did not answer		32	

\*Totals do not add to N as they were multiple response questions and the participants could check all or no checkboxes

Table 4.26 lists the selections from most to least common.

#### **4.8.3.2.6 Ethical Considerations - Students Consent to the Use of their LMS Data**

In addition, the students were asked two questions on permission to use their student data. Of the 639 respondents, 607 responded to these two questions (N=607). The first question was to use their data in LMS or other academic data held by university to identify and send early alerts about their performance. Of the 607 respondents, 404 students (66.6%) responded that they *agree*, 40 students (6.6%) responded that they *disagree* and 163 students (26.9%) were *not sure*. The second question asked for permission to access student demographic and academic background to support their learning. Again, of the 607 respondents, 400 students (65.9%) responded that they *agree*, 70 students (11.5%) responded that they *disagree* and 137 students (22.6%) were *not sure*. It is worth to note here that the majority of the students at Macquarie have no issues if their data is used to support their learning.

The association between the student demographics (gender, age, first language, ethnic background, enrolment status and employment status-hours) and both questions from the ethical considerations regarding student consent to the use of their data was evaluated using chi-square tests. For statistical analysis, adjustments

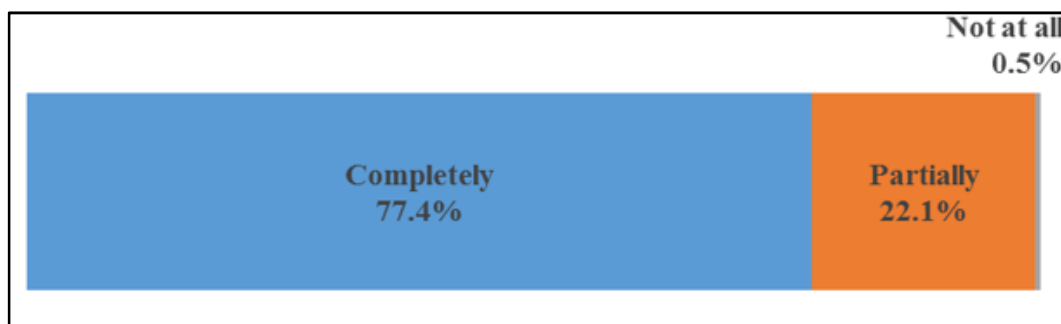
had been made to categories of the responses to meet the assumption. We found no statistically significant association between student demographics and the dependent variables ‘permission to use student data in iLearn or other academic data held by university’ and ‘permission to access student demographic and academic background to support their learning’ (all p-values were above 0.05).

#### **4.8.3.3 Unit Specific Information**

This section aims to identify unit specific learning and teaching factors that influence the initial goal and institutional commitments that the student brings to the university environment. The first question in this section was on the number of units’ students are studying in session 2 2015. Of the 639 respondents, 602 responded to this question (N=602); 410 students (68.1%) were studying 4 units followed by 133 students (22.1%) studying 3 units, 34 students (5.6%) taking 2 units, 14 students (2.3%) taking 5 units and only 11 students (1.8%) were doing 1 unit. By definition the students who have three or more units are full-time students (92.5%) which is similar to the demographic in Table 4.20. In a follow-up question students were asked for the unit they filled in the survey that if they were doing that unit for the first time. Of the 639 respondents, 602 responded to this question (N=602); 561 students (93.2%) responded that they were doing the units for the first time and 41 (6.8%) were repeating students.

Regarding understanding the unit requirements, students were asked if they have read the unit guide. Of the 639 respondents, 602 responded to this question (N=602); 595 students (98.8%) responded that they have read the unit guide and only 7 (1.2%) said that they did not read the unit guide.

In a following measure of the instrument students were asked about the understanding of the unit requirements. Of the 639 respondents, 602 responded to this question (N=602). 466 students (77.4%) responded that they *completely* understand the unit requirements, 133 students (22.1%) responded that they *partially* understand the unit requirements and 3 students (0.5%) did *not at all* understand the unit requirements (Figure 4.16).



**Figure 4.16: Final Study-Understand the unit requirements**

The association between the students who read the unit guide and the students who understood the unit requirements was evaluated using a chi-square test. We found that there is no statistically significant association between students who read the unit guide and the students who understand the unit requirements (chi-square = 0.526, degree of freedom = 2, p-value = 0.768;  $p < 0.05$ ).

Table 4.27 shows the means and standard deviations for the results to the question concerning the skills and abilities of students based on a 5 point Likert scale where 1 (not competent), 2 (somewhat competent), 3 (uncertain), 4 (competent) and 5 (highly competent). The worst skill was the time management with the lowest mean and the highest variability (standard deviation).

**Table 4.27: Final Study-Mean and Standard Deviation (SD) values for student skills and abilities (N=595)**

Student skills and abilities	Mean	SD
Computer skills	3.98	0.909
Problem solving skills	3.90	0.758
Academic ability	3.89	0.766
Critical thinking skills	3.77	0.803
Interpersonal skills	3.75	0.910
Competitiveness	3.58	0.983
Time management	3.27	1.057

Table 4.28 shows the frequency and percentages for the results to a question concerning the unit preparedness. Of the 639 respondents, 595 responded to this question (N=595).

**Table 4.28: Final Study-Unit Preparedness**

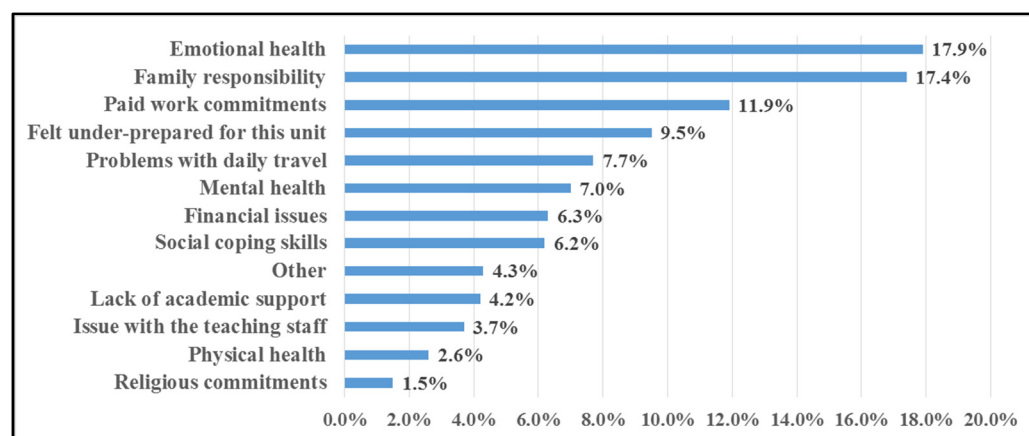
<b>Preparedness</b>	<b>Frequency</b>	<b>%</b>
Quite well	266	44.7
Fairly well	142	23.9
Very well	140	23.5
Very little	34	5.7
Unsure	7	1.2
Not at all	6	1.0

Survey participants were asked to indicate, through Likert scaled options, to what degree they rate their motivation in the unit for which they filled in the survey. Likert options were provided to allow respondents to express their opinions and ranged from 1-not true, 2-slightly true, 3-moderately true, 4-mostly true and 5-very true. Table 4.29 shows the means and standard deviations for all the results to this question concerning the student motivation in the respective units.

**Table 4.29: Final Study- Mean and Standard Deviation (SD) values for student motivation (N=595)**

<b>Student Motivation Items</b>	<b>Mean</b>	<b>SD</b>
I persist even when an assessment task is challenging for me	4.0	0.90
To accomplish my goals, it is important that I do well in this unit	3.8	1.05
I am motivated to do my required work in this unit	3.6	1.00
I feel confident that I will do well in this unit	3.5	0.97
I have to work too hard to succeed in this unit	3.1	1.17

In another multiple response question based on ‘mark all that apply’ (N=595) students were asked about which of the following factors, impeded students’ academic performance in a unit in session 2 2015. Figure 4.17 is the bar chart showing percentages for the results to a questions concerning factors that can affect student academic performance in a unit.

**Figure 4.17: Final Study-Factors affecting student performance in the respective unit (N=595)**

Results are consistent with the earlier studies showing that students referred mostly to emotional health (17.9%), family responsibilities (17.4%) and paid work commitments (11.9%).

#### **4.8.3.4 Attitude of Students Receiving an Early Alert/Intervention**

This section aims to capture data to answer the second research question proposed in chapter 1 that sought to explore the attitude of students receiving an early alert/intervention.

The survey instrument also investigated whether a student had been contacted by a teaching or student support staff at any stage about their academic performance in this unit. Of the 639 respondents, 595 responded to this question (N=595). The majority of the students 507 (85.2%) said that they were not contacted at any stage about their academic performance. Only 88 students (14.8%) said that they were contacted by a teaching or student support staff about their academic performance.

##### ***4.8.3.4.1 Did you follow-up or take any action as a result of the early alert notice?***

Out of 88 students contacted by the teaching staff for their academic position, a total of 65 students (73.9%) said that they followed-up or took an action and 23 students (26.1%) said that they did not follow-up with the teaching staff.

The association between the student demographics (gender, age, first language, ethnic background, enrolment status and employment status-hours) and the dependent variable 'followed-up or took any action as a result of early alert notice' was evaluated using a chi-square test. We found no statistically significant association between the two variables.

##### ***4.8.3.4.2 What specific action(s) did you take when you were first contacted by an early alert notice?***

Out of 65, 64 students who self-reported that they followed-up or took an action detailed the following specific actions taken as a result of a teacher notification in another multiple response question based on 'mark all that apply'. Table 4.30 shows that students mostly got attentive and started to work seriously (38.6%) followed by emailed teaching staff (37.3%).

**Table 4.30: Final Study-Specific actions students take when they were first contacted (N=64)\***

Description		N	%
Specific actions student take when they were first contacted	Got attentive and started to work seriously	32	38.6
	Emailed teaching staff	31	37.3
	Set an appointment for in-person meeting with my teaching staff	13	15.7
	Other	6	7.2
	Ignored the message	1	1.2

\* Totals do not add to N as they were multiple response questions and the participants could check all or no checkboxes

Table 4.30 lists the selections from most to least common.

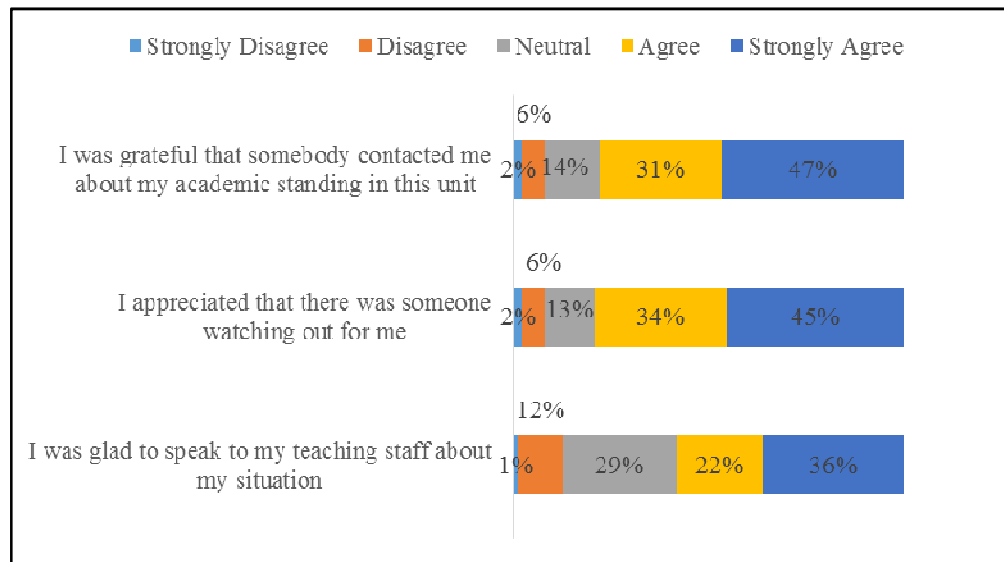
#### **4.8.3.4.3 What was your attitude towards being contacted via an early alert notice?**

Survey participants who received an alert (N=88) from the teaching staff were asked to indicate, through Likert scaled options about their attitude towards being contacted. Almost all of the students (N=86) appreciated being contacted by a teaching staff member. Likert options were provided to allow respondents to express their opinions and ranged from 1-strongly disagree, 2-disagree, 3-neutral, 4-agree and 5-strongly agree. Table 4.31 shows the means and standard deviations for the students' attitude towards being contacted by their unit teaching staff.

**Table 4.31: Final Study-Mean and Standard Deviation (SD) values for student attitude towards being contacted (N=86)**

Student attitude towards being contacted	Mean	SD
I appreciated that there was someone watching out for me	4.1	1.00
I was grateful that somebody contacted me about my academic standing in this unit	4.1	1.01
I was glad to speak to my teaching staff about my situation	3.8	1.09

Figure 4.18 shows that 58% either strongly agreed or agreed with the statements, "I was glad to speak to my teaching staff about my situation"; 79% either strongly agreed or agreed with the statements, "I appreciated that there was someone watching out for me"; and 78% either strongly agreed or agreed with the statements, "I was grateful that somebody contacted me about my academic standing in this unit".



**Figure 4.18: Final Study-Student attitude towards being contacted (N=86)**

The next questions demonstrate the students' attitude towards the intervention and their academic standing in the unit.

#### ***4.8.3.4.4 What is your attitude toward interventions and academic standing in the unit?***

The participants were asked to indicate, through Likert scaled options about their attitude towards interventions and academic standing in a unit. Likert options were provided to allow respondents to express their opinions and ranged from 1-strongly disagree, 2-disagree, 3-neutral, 4-agree and 5-strongly agree. Table 4.32 shows the means and standard deviations for the students' attitude towards interventions and academic standing in a unit.

**Table 4.32: Final Study- Mean and Standard Deviation (SD) values for student attitude towards interventions and academic standing in a unit (N=86)**

<b>Student attitude towards interventions and their academic standing in a unit</b>	<b>Mean</b>	<b>SD</b>
I feel better prepared to deal with my academic situation	3.7	0.95
I feel more comfortable now to seek academic assistance during the semester	3.5	0.97
I believe that student support services help	3.5	0.99
Now I know where to seek help for my academic studies	3.5	1.01

The next section demonstrates the impact of the intervention on change in students' behaviour for how they study for a unit.

#### 4.8.3.5 Intervention Impact on Change in Behaviour for How Students' Study for a Unit

This section aims to identify the third research question proposed in chapter 1 that sought to explore *do students report change in behaviour for how they studied for a unit, if they actually receive an early alert.*

##### 4.8.3.5.1 Actions(s) advised to students' VS Actions(s) students' actually took

Figure 4.19 shows a comparison about which action(s) were students advised to take and which action(s) they actually took.

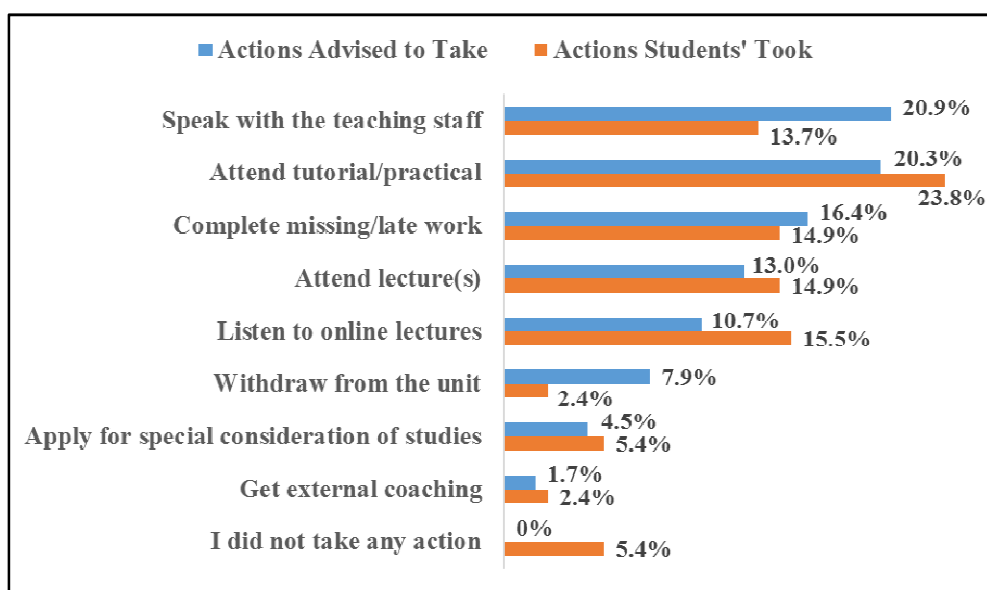


Figure 4.19: Final Study-A comparison between the actions students were advised to take and the actions they actually took after being contacted (N=80)

##### 4.8.3.5.2 Did receiving an email from your unit convenor change how you studied for this unit?

In another multiple response question based on 'mark all that apply', N=76 students were asked whether receiving an email from their unit convenor changed how they studied for this unit. Table 4.33 shows that 46.1% students marked, "It made me start to engage more with the readings and/or forums" followed by 30.4% marked, "It made me complete missing assignments and/or quizzes".

**Table 4.33: Final Study-Change in behaviour how a student studies after receiving an email from the unit convenor (N=76)\***

Description		N	%
Intervention Impact on Study	It made me start to engage more with the readings and/or forums	53	46.1
	It made me complete missing assignments and/or quizzes	35	30.4
	It made me want to give up	21	18.3
	It made me realise that I needed to get help in the unit	6	5.2

\* Totals do not add to N as they were multiple response questions and the participants could check all or no checkboxes

Table 4.33 lists the selections from most to least common.

#### **4.8.3.5.3 Do you think that receiving emails like this helped you to learn and do better in your unit?**

In a question, when respondents were asked whether in the future, they would want to receive similar emails in all the units that they were enrolled in (N=84); 77.4% marked 'yes' and 4.8% marked 'no' and 17.9% marked 'not sure'.

In another multiple response question based on 'mark all that apply', N=84 students were asked about that do they think that receiving emails like this helped them to learn and do better in your unit. Table 4.34 shows that 34.7% students marked, "The email did help me to improve my study habits" followed by 28.6% marked, "The email did help me to realise I was falling behind", 19.7% marked, "The email did help me by telling me what I could do to improve my results in the unit" and 12.2% students marked, "The email did help me by suggesting resources or help that I was not aware of".

**Table 4.34: Final Study-Intervention impact on student learning (N=84)\***

Description		N	%
Intervention impact on student learning	The email did help me to improve my study habits	51	34.7
	The email did help me to realise I was falling behind	42	28.6
	The email did help me by telling me what I could do to improve my results in the unit	29	19.7
	The email did help me by suggesting resources or help that I was not aware of	18	12.2

\* Totals do not add to N as they were multiple response questions and the participants could check all or no checkboxes

Table 4.34 lists the selections from most to least common.

**4.8.3.5.4 *Now that you have received email(s) from your unit convenor, what would be the impact on you if you no longer received emails in other units?***

In a question where respondents were asked what would be the impact if they no longer receive emails in other units? (N=84); 51.2% marked that it would impact on them because they feel that they would not do as well in future if they did not receive emails such as they received; 38.1% marked that they think there would be no impact on how well they do; and 10.7% marked other.

**4.8.3.6 Intervention Impact on Student Performance and Motivation to Continue in the Unit**

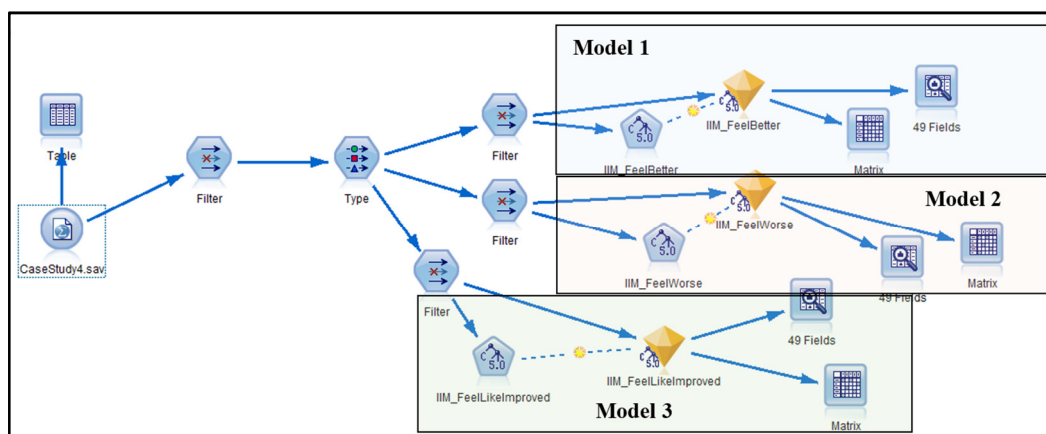
This section aims to identify the fourth research question proposed in chapter 1 that sought to explore *whether early alerts increase student performance and motivation to continue in the unit.*

**4.8.3.6.1 *What impact did receiving an email from your unit convenor have on your motivation to continue in the unit?***

We used IBM SPSS Modeler 18.0 to identify the impact of early alerts/intervention emails on students' motivation to continue in the unit. The data of the 88 respondents' who were contacted about their academic performance were used for analysis. Using 10-fold cross-validation with pruning severity of 75% and minimum of 10 records per branch, we created C5.0 decision tree models using the final data set from 88 observations and 49 variables. C5.0 decision tree models are widely used for classification problems due to their efficiency and ease of interpretation of the results (Wu et al. 2008).

**4.8.3.6.1.1 Decision Trees (Results)**

To identify the impact of the early alert or intervention from the unit convenor on the respondent's motivation to continue in the unit, we created 3 models (Figure 4.20) for each of the three possible responses (feel better, feel like improved or feel worse). These responses form three motivation categories.



**Figure 4.20: Decision Trees (stream) in SPSS Modeler**

The outcome/target variables for each decision tree are shown in Table 4.35.

**Table 4.35: Outcome/Target variable**

Survey Question	Variable Name for analysis	Possible answers in the survey
What impact did receiving an email from your unit convenor have on your motivation to continue in the unit? (Mark all that applies)	InterventionImpactMotivation_Feel Better	- It made me feel better
	InterventionImpactMotivation_Feel Worse	- It made me feel worse
	InterventionImpactMotivation_Feel LikeImproved	- It made me feel like I could improve

\*The abbreviation IIM is used for InterventionImpactMotivation in the decision trees in Figure 4.20

Students were allowed to pick multiple responses for this survey question. Interestingly one student picked both *feel better* and *feel worse*, five students picked *feel worse* but at the same time they picked that they *could improve*, and eighteen students picked *feel better* and *could improve*. Due to the nature of the question, we analysed each option separately as an outcome variable (feel better, feel like improved or feel worse) when we were building decision trees to identify influential factors on students' feelings (Table 4.35).

The influential factors considered for the decision trees are listed in Appendix E which included some demographic information and study related factors.

The variables identified as important factors for the three decision trees are summarised in Table 4.36 (that is a subset of the input variables table in the Appendix E) for ease of understanding, readability and presentation.

**Table 4.36: Variables identified as important factors by the three Decision Trees**

Survey Question	Variable Name for analysis	Possible answers in the survey
On average, approximately how many hours did you spend per week on employment?	Employment	- < 5                      - 5 – 10 - 11 – 15                - 16 – 20 - > 20                    - Not working
What impact did receiving an email have on how you viewed your unit convenor?	InterventionImpactUC_Supporting	- It made me feel like the unit convenor was supporting me to do well
	InterventionImpactUC_Concerned	- It made me feel like the unit convenor was concerned about me
	InterventionImpactUC_Interested	- It made me feel like the unit convenor was interested in what I did in the unit
	InterventionImpactUC_Personal	- It made the unit feel more personal
Which actions(s) were you advised to take? (Mark all that applies)	ActionAdvised_ContactTeachingStaff	- Speak with the teaching staff
	ActionAdvised_AttendTutorial	- Attend tutorial or practical
	ActionAdvised_AttendLecture	- Attend lecture(s)
	ActionAdvised_OnlineLecture	- Listen to online lectures
	ActionAdvised_CompleteAssessment	- Complete missing/late work
	ActionAdvised_Coaching	- Get external coaching
	ActionAdvised_Withdraw	- Withdraw from the unit
	ActionAdvised_SpecialConsideration	- Apply for special consideration
Which actions(s) did you take? (Mark all that applies)	ActionsTook_ContactTeachingStaff	- Speak with the teaching staff
	ActionsTook_AttendTutorial	- Attend tutorial or practical
	ActionsTook_AttendLecture	- Attend lecture(s)
	ActionsTook_OnlineLecture	- Listen to online lectures
	ActionsTook_CompleteAssessment	- Complete missing/late work
	ActionsTook_Nothing	- I did not take any action
	ActionsTook_Coaching	- Get external coaching
	ActionsTook_Withdraw	- Withdraw from the unit
	ActionsTook_SpecialConsideration	- Apply for special consideration

<b>Survey Question</b>	<b>Variable Name for analysis</b>	<b>Possible answers in the survey</b>
Did you follow-up or take any action as a result of being contacted?	Recoded_FollowedUp	- Yes - No
Did receiving an email from your unit convenor change how you studied for this unit? (Mark all that applies)	InterventionImpactStudy_Engagement	- It made me start to engage more with the readings and/or forums
	InterventionImpactStudy_CompleteAssessments	- It made me complete missing assignments and/or quizzes
	InterventionImpactStudy_GetHelp	- It made me realise that I needed to get help in the unit
	InterventionImpactStudy_GiveUp	- It made me want to give up
Do you think that receiving emails like this helped you to learn and do better in your unit? (Mark all that applies)	InterventionImpactPerformance_StudyHabits	- The email did help me to improve my study habits
	InterventionImpactPerformance_FallingBehind	- The email did help me to realise I was falling behind
	InterventionImpactPerformance_SuggestResources	- The email did help me by suggesting resources or help that I was not aware of
	InterventionImpactPerformance_ImproveResults	- The email did help me by telling me what I could do to improve my results in the unit

**When the Target variable is Intervention Impact on Student Motivation-Feel Better (InterventionImpactMotivation\_FeelBetter)?**

Table 4.37 shows counts and percentages for each response as observed (in the rows) and predicted (in the columns). A chi-square test shows a highly significant result for this model (chi-square = 35.71, degree of freedom = 1, p-value < 0.001). The highlighted cells give us accuracies for each outcome category. The model is able to classify 83.3% of *I don't feel better* participants and 80.4% of the *I feel better* participants into their correct categories. The total accuracy of the model is 81.8%.

**Table 4.37: Accuracy matrix for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Better”**

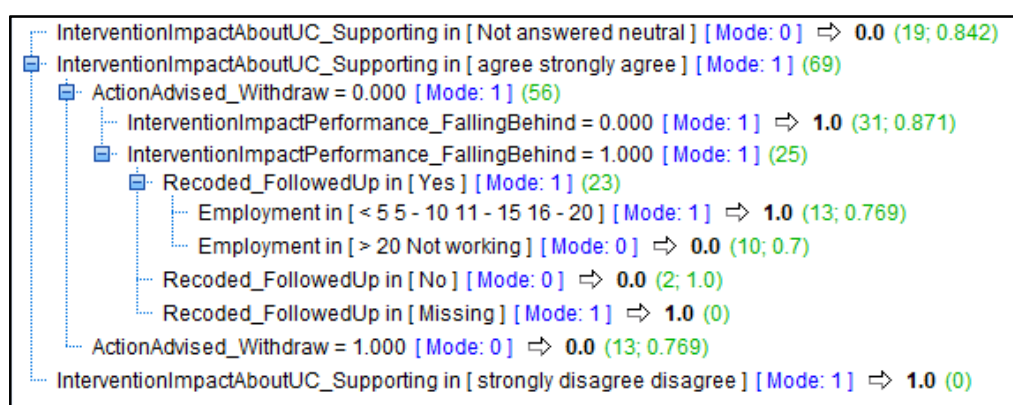
IIM_FeelBetter		0 (I Don't Feel Better)	1 (I Feel Better)	Total	Accuracy %	Lift
0 (I Don't Feel Better)	Count	35	7	42	83.3	1.67
	Row %	83.3	16.7	100.0		
	Column %	79.5	15.9	47.7		
	Total %	39.8	8.0	47.7		
1 (I Feel Better)	Count	9	37	46	80.4	1.61
	Row %	19.6	80.4	100.0		
	Column %	20.5	84.1	52.3		
	Total %	10.2	42.0	52.3		
Total	Count	44	44	88	81.8	
	Row %	50.0	50.0	100.0		
	Column %	100.0	100.0	100.0		
	Total %	50.0	50.0	100.0		
		$\chi^2=35.71, df=1, p<0.001$				

From all the influential factors considered for the decision tree (Appendix E), only five of them are identified as the important variables based on the impurity measure of the decision tree and used as predictors (Table 4.38). After receiving an early alert/intervention, the student's view that their *unit convenor supporting them to do well* was identified as the most important variable to classify a student into “feel better” motivation category to continue in the unit. Other variables identified to classify the participants were *intervention impact to help realise a student is falling behind, action advised to withdraw from the unit, employment* and to *follow up* as a result of being contacted.

**Table 4.38: The variable importance for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Better”**

Nodes	Importance
InterventionImpactAboutUC_Supporting	0.33
InterventionImpactPerformance_FallingBehind	0.20
ActionAdvised_Withdraw	0.18
Employment	0.15
Recoded_FollowedUp	0.13

The full decision tree for “*feel better or not*” outcome can be seen in Figure 4.21.



**Figure 4.21: Decision tree for intervention impact on student motivation “feel better”. Mode 1=I feel better and Mode 0=I don’t feel better**

All the participants who did not answer or were neutral towards whether their unit convenor was supportive were classified into *I don’t feel better* category and this classification was correct 84.2% of the participants.

If the participants viewed the unit convenor as supportive, then other variables are used for classification.

- If the action advised was not to withdraw from the unit and the intervention email did not make participants realise that they were falling behind in their learning (InterventionImpactPerformance\_FallingBehind=0), then participants were classified into *I feel better* category and this classification was correct 87.1% of the participants.
- If the action advised was not to withdraw from the unit; the intervention email made participants realise that they were falling behind in their learning (InterventionImpactPerformance\_FallingBehind=1); they got in touch with their unit convenor regarding the early alert

- If they were working between 5 and 20 hours a week, then participants were classified into *I feel better* category. This classification was correct for 76.9% of the 13 participants.
- On the other hand, the 10 participants who were working more than 20 hours/week or not working were classified into *I don't feel better* category. This classification was correct for 70% of the participants.
- If the action advised was to withdraw from the unit then participants were classified into *I don't feel better* category and this classification was correct for 76.9% of the participants.

### When the Target variable is Intervention Impact on Student Motivation-Feel Like Improved (IIM-FeelLikeImproved)?

Table 4.38 shows counts and percentages for each response as observed (in the rows) and predicted (in the columns). A chi-square test shows a significant result for this model (chi-square = 28.38, degree of freedom = 1, p-value < 0.001). The highlighted cells show the accuracies for each outcome category. The model is able to classify 76.7% of *I don't feel improved* participants and 80.0% of the *I feel like improved* participants into their correct categories. The total accuracy of the model is 78.4%.

**Table 4.39: Accuracy matrix for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Like Improved”**

IIM_FeelLikeImproved		0 (I Don't Feel Improved)	1 (I Feel Like Improved)	Total	Accuracy %	Lift
0 (I Don't Feel Improved)	Count	33	10	43	76.7	1.61
	Row %	76.7	23.3	100.0		
	Column %	78.6	21.7	48.9		
	Total %	37.5	11.4	48.9		
1 (I Feel Like Improved)	Count	9	36	45	80.0	1.53
	Row %	20.0	80.0	100.0		
	Column %	21.4	78.3	51.1		
	Total %	10.2	40.9	51.1		
Total	Count	42	46	88	78.4	
	Row %	47.7	52.3	100.0		
	Column %	100.0	100.0	100.0		
	Total %	47.7	52.3	100.0		
$\chi^2=28.379$ , df=1, p<0.001						

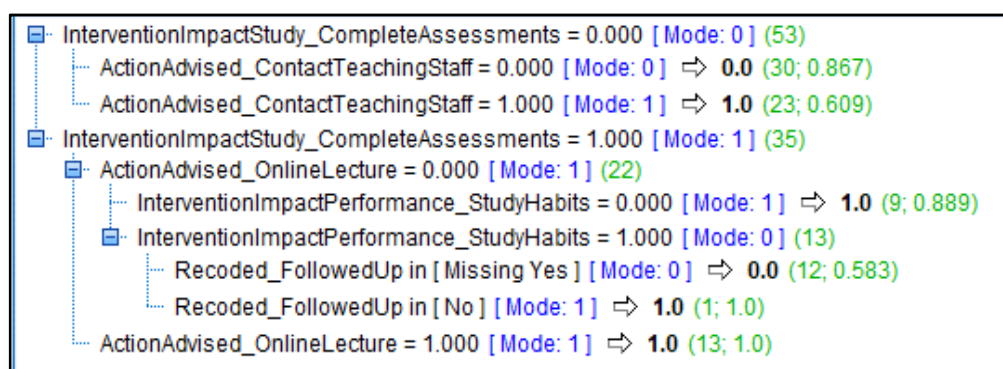
The predictor variables of this decision tree are shown in Table 4.40. After receiving an early alert/intervention, students changed their behaviour to study for a unit by

*completing missing assessments* has been identified as the most important variable to classify a student into “feel like improved” motivation category. Other variables identified to classify the participants were action advised to *listen to online lectures* and to *speak with the teaching staff*, followed by, *improvement in study habits* and to *follow up* as a result of being contacted.

**Table 4.40: The variable importance for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Like Improved”**

Nodes	Importance
InterventionImpactStudy_CompleteAssessments	0.38
ActionAdvised_OnlineLecture	0.26
ActionAdvised_ContactTeachingStaff	0.22
InterventionImpactPerformance_StudyHabits	0.07
Recoded_FollowedUp	0.04

The full decision tree for “*feel like improved or not*” can be seen in Figure 4.22.



**Figure 4.22: Decision tree for intervention impact on student motivation “feel improve”.  
Mode 1=I feel like improved and Mode 0=I don’t feel improved**

After receiving an alert email from the unit convenor, participants who stated that the email did not make them complete their missing assignments and/or quizzes and we were not advised to contact the teaching staff were classified into *I don’t feel improved* category and this classification was correct for 86.7% of the participants (N=30).

After receiving an alert email from the unit convenor, participants who stated that the email did not make them complete their missing assignments and/or quizzes and we were advised to contact the teaching staff were classified into *I feel like improved* category and this classification was correct for 60.9% of the participants (N=23).

If the participants stated that they completed their missing assessments, then other variables are used for classification.

- If the participants did not listen to online lecture and did not report a change in their study habits after receiving the intervention email were classified into *I feel like improved* category. This classification was correct for 88.9% of the participants (N=9).
- If the participants did not listen to online lecture; reported a change in their study habits; and indicated that they followed-up with the unit convenor regarding their academic performance were classified into *I don't feel improved* category. This classification was correct 58.3% of the participants (N=12).
- The participants who listened to the online lecture were classified into *I feel like improved* category and this classification was correct 100% of the participants (N=13).

#### **When the Target variable is Intervention Impact on Student Motivation-Feel Worse (IIM-FeelWorse)?**

Table 4.41 shows counts and percentages for each response as observed (in the rows) and predicted (in the columns). A chi-square test shows a significant result for this model (chi-square = 24.16, degree of freedom = 1,  $p < 0.001$ ). The highlighted cells show the accuracies for each outcome category. The model is able to classify 76.9% of *I don't feel worse* participants and 100.0% of the *I feel worse* participants into their correct categories. The total accuracy of the model is 79.5%.

**Table 4.41: Accuracy matrix for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Worse”**

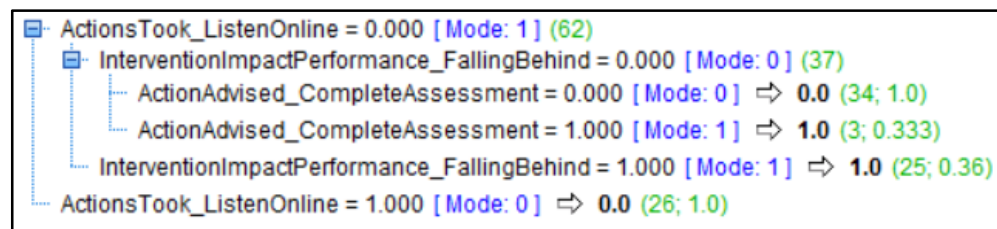
IIM_FeelWorse		0 (I Don't Feel Worse)	1 (I Feel Worse)	Total	Accuracy %	Lift
0 (I Don't Feel Worse)	Count	60	18	78	76.9	1.13
	Row %	76.9	23.1	100.0		
	Column %	100.0	64.3	88.6		
	Total %	68.2	20.5	88.6		
1 (I Feel Worse)	Count	0	10	10	100.0	3.14
	Row %	0.0	100.0	100.0		
	Column %	0.0	35.7	11.4		
	Total %	0.0	11.4	11.4		
Total	Count	60	28	88	79.5	
	Row %	68.2	31.8	100.0		
	Column %	100.0	100.0	100.0		
	Total %	68.2	31.8	100.0		
$\chi^2=24.176, df=1, p<0.001$						

The predictor variables of this decision tree are shown in Table 4.42. The variables identified to classify the participants were the action students took to *listen to the online lectures*, intervention impact of the early alert that helped student to realise that they were *falling behind* and the action advised to *complete the missing assessments*.

**Table 4.42: The variable importance for C5.0 Decision Tree for Intervention Impact on Student Motivation “Feel Worse”**

Nodes	Importance
ActionsTook_ListenOnline	0.45
InterventionImpactPerformance_FallingBehind	0.43
ActionAdvised_CompleteAssessment	0.11

The full decision tree for “*feel worse or not*” can be seen in Figure 4.23.



**Figure 4.23: Decision tree for intervention impact on student motivation “feel worse”. Mode 1=I feel worse and Mode 0=I don’t feel worse**

After receiving an alert email from the unit convenor, participants who stated that they did not listen to the online lecture; they did not realise that they were falling behind and were not advised by the unit convenor to complete assessment tasks were classified into *I don't feel worse* category. This classification was correct 100% of the participants (N=34).

After receiving an alert email from the unit convenor, participants who stated that they did not listen to the online lecture; they did not realise that they were falling behind and were advised by the unit convenor to complete assessments tasks, then participants were classified into *I feel worse* category. However, this classification was only 33% correct out of 3 participants.

On the other hand, 25 (out of 62) participants who stated that they did not listen to the online lecture after receiving an alert email from the unit convenor; but realised that they were falling behind were classified into *I feel worse* category and this classification was correct 36.0% of the participants.

All 26 participants who stated that they did listen to the online lecture after receiving the intervention email were classified into *I don't feel worse* category. This classification was correct 100% of the participants (N=26).

### **In a Nutshell**

The purpose of this modeling process was to find out how the behaviour of the participating students who received an alert was changed. The interpretation of the results from the three decision trees discussed above was useful to understand certain variables (demographics and others) that impact student behaviour and motivation. We found that participants who felt better after receiving an alert viewed their unit convenor as supporting. The participating students comprehend the fact that receiving an alert or intervention email can help them to learn and do better in the unit. It was interesting to note that students who realised after receiving an alert that they were falling behind got in touch with their unit convenor regarding the early alert. Most of the students who followed-up with their unit convenors were working between 5 and 20 hours a week. Students who were not working or working more than 20 hours/week did not follow-up with their unit convenors. This is consistent with the research that undergraduates who work moderate hours (such as less than 20 hours/week) per week are more structured with their time and more

likely to continue (Coates 2010b). The participants feel like they have improved if they were advised to contact the teaching staff and/or complete their missing assessments instead of just to advise them to listen to online lectures to catch up the unit content or to withdraw from the unit.

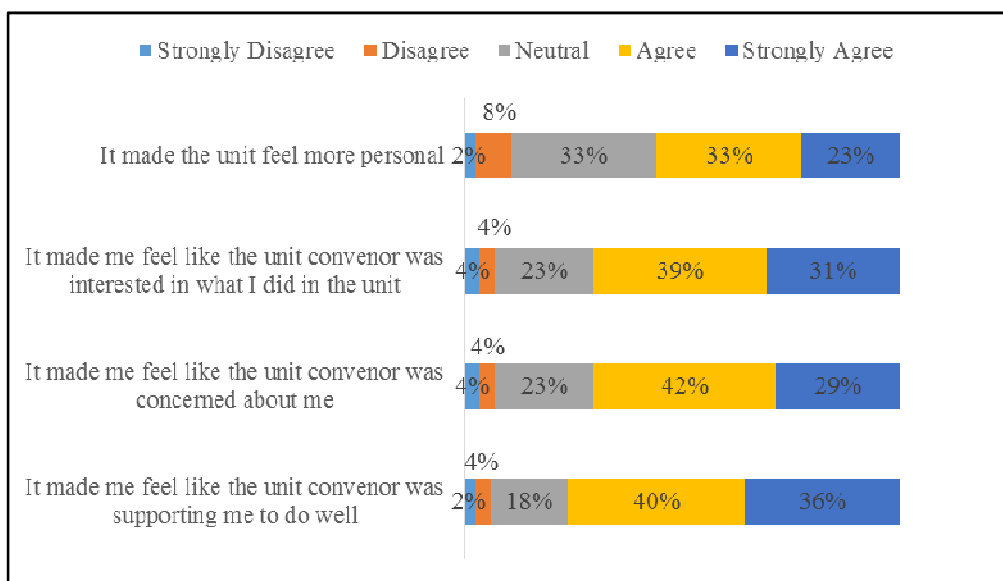
#### **4.8.3.6.2 *What impact did receiving an email have on how you viewed your unit convenor?***

Survey participants were asked to indicate, through Likert scaled options about their opinions on intervention impacts such as what impact did receiving an email have on how you viewed your unit convenor. Likert options were provided to allow respondents to express their opinions and ranged from 1-strongly disagree, 2-disagree, 3-neutral, 4-agree and 5-strongly agree. Table 4.43 shows the means and standard deviations for all the results to this question concerning the intervention impact on students on how they view their unit convenor.

**Table 4.43: Final Study-Mean and Standard Deviation (SD) values for intervention impact on student on how they view their unit convenor (N=84)**

<b>Intervention impact on how a student view unit convenor</b>	<b>Mean</b>	<b>SD</b>
It made me feel like the unit convenor was supporting me to do well	4.23	0.73
It made me feel like the unit convenor was concerned about me	4.11	0.74
It made me feel like the unit convenor was interested in what I did in the unit	4.13	0.76
It made the unit feel more personal	3.98	0.80

Figure 4.24 shows that 76% either strongly agreed or agreed with the statements, “It made me feel like the unit convenor was supporting me to do well”; 71% either strongly agreed or agreed with the statements, “It made me feel like the unit convenor was concerned about me”; 70% either strongly agreed or agreed with the statements, “It made me feel like the unit convenor was interested in what I did in the unit”; and 56% either strongly agreed or agreed with the statements, “It made the unit feel more personal”.



**Figure 4.24: Final Study-Intervention impact on student on how they view their unit convenor**

The next questions demonstrate some quotes from students about their feelings after being contacted.

### **How you felt about how you were doing in the unit after being contacted by email?**

In an open ended question, students were asked to indicate how they felt about how they were doing in the unit after being contacted by email. There were some very interesting responses as follows. The number in parenthesis at the end of the few responses shows the number of times the opinion is given.

“I’m glad I was contacted as it motivated me to complete the work and almost “show” the unit convenor that I could do it.”

“I felt like I needed to actively work throughout the semester, rather than procrastinating.”

“Given the fact that the unit convenor took the time to send an email shows his enthusiasm about teaching this unit and his willingness to engage with the students. He goes beyond his obligations as a lecturer and shows genuine concern about the students’ performance, something that I haven’t experienced in any of my previous units.”

“Because it was a wake-up call, there is help available but I need to be receptive to this help and make sure to commit more time to the unit so that I am well prepared for my exam.”

“I know I was a capable student, who just lacked major motivation. The email basically kicked me into gear and I completed all my assessments post-email to a high level.”

“It was encouraging/motivating/felt more confident.” (13)

“The unit convenor gave me specific advice and encouraged me and it made me feel much better.”

“I felt like the convenor cared and wanted me to do well.” (9)

“Considering that this unit is almost external (i.e. our lectures are all online but our tutorials are in person), you don’t expect the lecturer/unit convenor to know who you are, so for him to reach out to the students (after discussing with other students, we realised it was probably on a mass scale) added a personal level that you’d usually get by going to the lectures but that he managed to do without us meeting him personally.”

“Made me feel like the unit convenor is not concerned just about the overall performance but rather is more invested in individual students’ performance.”

#### **4.8.3.7 Intervention Impact to Increase Student Motivation to Utilise the Campus Support Services**

This section aims to identify the fifth research question proposed in chapter 1 that sought to explore *do early alert notifications increase student motivation to utilise the campus support services*.

##### **4.8.3.7.1 *Were you advised to seek help from teaching or any student support services?***

In a question, when asked whether they had been advised to seek help from any teaching or student support services. Of the 84, 38 students (45.2%) marked ‘yes’ and 46 students (54.8%) marked ‘no’.

##### **4.8.3.7.2 *Which student support services from the campus wellbeing were you advised to visit?***

Out of 88, 84 students who indicated the support services they were advised to visit in another multiple response question based on ‘mark all that apply’. Table 4.44 shows that the student support services from the campus wellbeing most commonly advised to visit were *ask.mq.edu* (17.4%) and *academic advice* (16.0%) followed by *learning skills program* (9.0%), *numeracy centre* (6.9%) and *counselling service* (6.3%).

**Table 4.44: Final Study-Student support services advised to visit (N=84)\***

Description		N	%
Student support services advised to visit	Ask.edu.au	25	17.4
	Academic Advice	23	16.0
	Learning skills program	13	9.0
	Numeracy centre	10	6.9
	Counselling service	9	6.3
	Health and wellbeing service	7	4.9
	Career & Employment service	7	4.9
	Welfare service (financial aid services, academic progress issues)	6	4.2
	Financial aid services	4	2.8
	Disability service (disability support unit)	3	2.1
	Tech Help	2	1.4
	Chaplaincy service	2	1.4
	Education services for overseas students (ESOS)	2	1.4

\* Totals do not add to N as they were multiple response questions and the participants could check all or no checkboxes

Table 4.44 lists the selections from most to least common.

#### ***4.8.3.7.3 Did the early alert notice provide you with campus student support services that you did not previously know about?***

In answer to this question, 29 students (34.5%) responded that when they were contacted they were provided with information about campus support services that they did not previously know about. On the other hand, 55 students (65.5%) responded that when they were contacted they were not provided with information about campus support services that they did not previously know about.

#### ***4.8.3.7.4 What is student attitude towards campus wellbeing services at Macquarie University relevant to the unit?***

Table 4.45 shows the respondents choices in another multiple response question based on 'mark all that apply' regarding student's attitude towards campus wellbeing services relevant to a unit. The responses were positive as 33 students (31.4%) said that the support services were available to help them followed by 27 students (25.7%) said that the hours of operation for the student support services were convenient. 11 students (10.5%) said that the support services were able to help resolve their issue(s) and 10 students (9.5%) said that support services provided them with the accurate information.

**Table 4.45: Final Study-Student's attitude towards Campus Wellbeing services (N=84)\***

Description		N	%
Student's Attitude towards Support Services	Student support services were available to help me	33	31.4
	The hours of operation for the student support services were convenient	27	25.7
	Student support services were able to help resolve my issue(s)	11	10.5
	Student support services provided me with the accurate information	10	9.5

\* Totals do not add to N as they were multiple response questions and the participants could check all or no checkboxes

Table 4.45 lists the selections from most to least common.

#### ***4.8.3.7.5 How satisfied are you with the contact you received from the teaching or student support staff about your progress?***

In a last question regarding students' satisfaction with the contact they received from the teaching or student support staff about their progress (N=80); 39 students (48.8%) said they were satisfied, 21 (26.3%) were neutral and 18 (22.6%) were completely satisfied and only 2 students (2.5%) were dissatisfied stating that "it does not make any difference" and the other referred to "the poor unit design and unit management that the tutor didn't showed up or was late and had serious attitude". The student was unhappy to be told to withdraw for missing one class.

#### **4.8.3.8 Behavioural Analysis of Students Before and After Receiving an Early Alert or Intervention Email**

We conducted behavioural analysis of four random students enrolled in a 100-level Information System unit ISYS1XX in semester 2 2015 (Case Study 4). This unit was chosen from the 17 units in this semester, as mentioned in section 4.2, because the unit is offered within our department, thus we have access to the live iLearn log (not just the test server) and student grades. The unit is structured as follows:

- Each week, students were required to attend two hours of lectures (or watch the recorded lecture) and a two-hour workshop (including a tutorial and a practical)
- Materials to support the lectures (slides and recommended book chapters) and workshops (weekly worksheets) are made available within the LMS
- Weekly quiz submissions to ensure student engagement during the semester
- Workshop participation

- Three assignments
- Final exam

We had 75 respondents from the chosen unit which had an enrolment of 476 students. There were 63 students who did not receive an alert and 8 reported that they received an alert regarding their academic performance (Missing = 4). The respondents were divided into two groups. *Group 1* represents the students who did not receive an alert from their unit convenor for their academic progress. *Group 2* represents the students who received an alert/intervention for their academic progress during the semester. Two students from each group were selected. We were able to find 2 students who responded to survey and received an alert (Group 2) therefore we randomly selected two students from Group 1 by using SPSS so that the number of students in each group is equal. The students' behaviours were compared to their responses to the (part of) student survey that explored what actions they took when they were contacted.

The Moodle raw log table for the chosen unit was extracted with a total of 313, 270 records. Each record in the log has nine (9) attributes: time, user name, affected user, event context, component, event name, description, origin and user's IP address. For this analysis, we only focused on the user name, event name and time of the event. The event name represents the actions initiated by students on various unit related activities accessed with Moodle such as unit content viewed, assignment or quiz submission and forum or discussion posts created, viewed, posted or deleted. The log was analysed initially for the four indicators: login activity, forum activity, assessment activity and gradebook activity. The four selected students have no entries for the gradebook activity so the following Table 4.46 shows the event names grouped for the other three indicators.

**Table 4.46: Data selection for the three indicators**

<b>Login Activity</b>	<b>Forum Activity</b>	<b>Assessment Activity</b>
Unit viewed	Post created	Status of the submission viewed
Unit page access clicks	Post updated	Submission form viewed
Unit module viewed	Post deleted	Submission created
File access clicks	Some content posted	Submission submitted
URL access clicks	Discussion viewed	Submission updated
	Discussion created	File uploaded
	Comment created	Online text uploaded

The following sections describes the Group 1 students who did not receive an alert.

#### **4.8.3.8.1 Group 1: Students who did not receive an alert**

There was one female (S1) and one male (S2) student in the random sample for Group 1. The female student was in the 19-24 age group and the male was from the 25-34 age group. Both students were domestic, had English as their first language and continuing students (2<sup>nd</sup> year, 3<sup>rd</sup> year or above). The female was a full-time student from the Science faculty, worked approximately 5-10 hours per week and did not like to be contacted if her performance is unsatisfactory in a unit. She obtained a *Pass* grade in the unit. The male student was a full-time student from the Business faculty, worked approximately > 20 hours per week and would like to be contacted as soon as his performance gets unsatisfactory in a unit. He obtained a *High Distinction (HD)* grade in the unit.

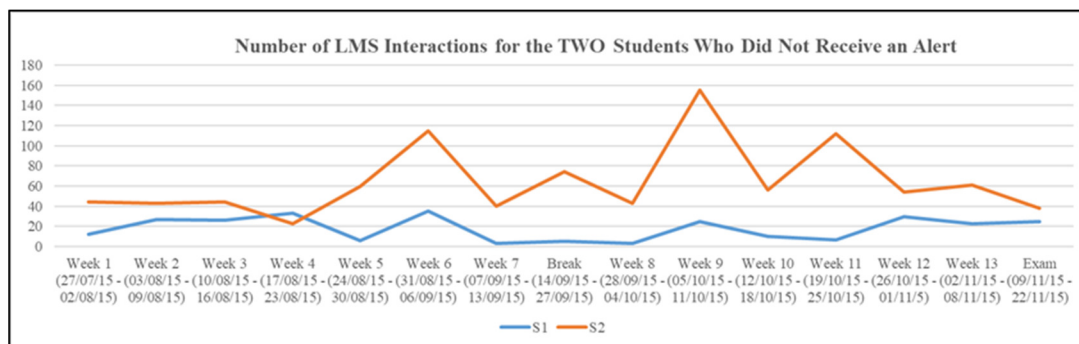
Both students were asked for future purposes what specific behaviours they would like to be contacted, how they would like to be contacted and what specific strategies would help them. It is interesting to note that the male student wanted to be contacted for all the possible behaviours mentioned in the options (frequent absences, lack of participation/effort, low scores in assessments, missing work, not logged in to iLearn for more than a week, discussion postings not read, no participation in discussion forums, announcements not read, lecture content or lecture resources not viewed, in-class behavioural problems, how he is doing compared to the rest of the class and plagiarism) while the female student would like to be contacted for missing work only.

Both students would like to be contacted via *university email* and mentioned different strategies which can motivate them to seek help. The only common strategy was that *they can manage themselves*. The reason might be that they are continuing students and are more adjusted to the higher education environment as compared to a first year student. Neither of them had issues with giving permission to access their iLearn data, academic data or demographics to send them alerts about their performance and/or support their learning.

Regarding their unit related information, both were doing the unit for the first time, had read the unit guide, completely understood the unit requirements and felt well-prepared for the unit. The full-time female student mentioned emotional health as a

factor that can affect her academic performance. While the male student who worked >20 hours per week mentioned paid work commitments as a major factor.

Figure 4.25 shows the summary of the number of LMS interactions for the two students. The LMS interactions clearly depict that student 2, who was more engaged with the unit, got a higher grade.



**Figure 4.25: Number of LMS Interactions for the Two Students Who Did Not Receive an Alert (Group 1)**

The next sections describe the Group 2 students who received an alert/intervention.

#### **4.8.3.8.2 Group 2: Students who received an alert/intervention**

We analysed two students who received early alert email/s from the unit convenor during the semester. We also compared this to their responses to the student survey to further explore what they have said when they were contacted. The results show some evidence in the student's behaviour that there was a positive impact on student engagement with the unit after the receipt of an email.

##### **4.8.3.8.2.1 Group 2-Student 1**

Group 2-Student 1 was a full-time domestic male student in the 19-24 age group. His first language was English and was a continuing student (2<sup>nd</sup> year, 3<sup>rd</sup> year or above) from the Business faculty. He was working > 20 hours per week and would like to be contacted if his performance is unsatisfactory in a unit. Regarding the unit related information, he was doing the unit for the first time, had read the unit guide, partially understood the unit requirements and was unsure about his preparedness for the unit. He obtained a *Credit* grade in the unit. He received two emails from the unit convenor.

First on 10/9/2015 (in week 7) for missing assignment 1:

*Dear STUDENT FIRST NAME,*

*How are you? I noticed that as of a couple of days ago, you hadn't submitted Assignment 1 for ISYS1XX. That assessment task is worth 18% of your total marks. Not only do you lose those marks by not submitting your solution, if you don't know the material about database modeling and using ER diagrams, you will not be able to pass Section B of the final exam.*

*I encourage you to catch up on the lecture and textbook material from Weeks 2-4 (workshops 3-5) and have a serious go at Assignment 1. If you get it in the next 10 days, we'll mark it to give you feedback, even though it is now too late to get the marks included in your final total.*

*If you are struggling with the unit content, you can visit HELP101 in Room X, see tutor consultation times. [link provided]*

*Remember that the Health and Wellbeing team are available to help you with welfare, counselling, medical, and any other non-academic concerns that you may have. Visit them at [link provided]*

*If you put in a special consideration for late submission, please get your submission in by the agreed date.*

*Please let me know if you need clarification over any matter in ISYS1XX.*

Second on 25/9/2015 (in the mid-semester break between week 7 and 8) before the HECS census date.

*Dear STUDENT FIRST NAME,*

*It seems that you are slipping behind in ISYS1XX. If you are not planning to catch up, I suggest you consider withdrawing from the unit by September 28th, which is the last date to withdraw from a unit without academic penalty. This means your withdrawal won't be treated as a fail on your academic record.*

*If you are struggling with the unit content, you can visit HELP101 in Room X, see tutor consultation times. [link provided]*

*Remember that the Health and Wellbeing team are available to help you with welfare, counselling, medical, and any other non-academic concerns that you may have. Visit them at [link provided]*

*Please let me know if you need clarification over any matter in ISYS1XX.*

In the survey, he indicated that when he was contacted, he followed-up with the teaching staff and asked for more information on how to improve. He also mentioned that it made him engage more with the readings and/or forums and complete missing assignment and/or quizzes.

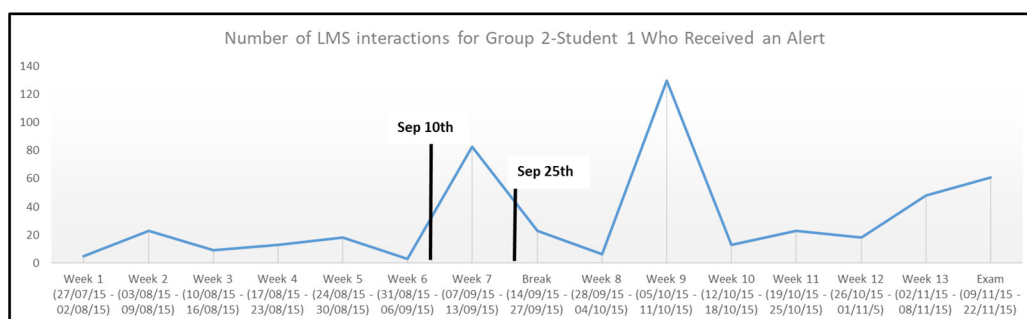
Table 4.47 shows the overall LMS interactions for the student and the mean values for each indicator before and after the intervention emails. It is clear that on average his login and forum activities doubled (logged in 13.3 times more, participated 4.8 times more in forum activities). Since there were only limited assessments, it is not surprising to note that assessment activities did not increase much, nevertheless they increased on average from 4.1 before intervention to 4.4 after intervention.

**Table 4.47: Group 2-Student 1 Indicators Hits Summary Before and After the Intervention Emails**

	Before the intervention			After the intervention			Change (After-Before)
Indicators	N	Mean (SD)	Median	N	Mean (SD)	Median	Mean
Login Activity	93	13.2 (14.01)	7	212	26.5 (20.51)	17.5	13.3
Forum Activity	32	4.6 (10.83)	0	75	9.4 (19.09)	2	4.8
Assessment Activity	29	4.1 (4.22)	2	35	4.4 (4.90)	3	0.3

*Note:* Before the intervention period is from week 1-week 7 (Total-7 weeks). After the intervention period is from Break-Exam period (Total-10 weeks). The total (N), mean (SD) and median are calculated as on the number of LMS interactions for the respective periods.

The intervention emails this student received in week 7 and then just before week 8 appeared to have resulted in increased LMS interactions (Figure 4.26). He had completed the missing assignment 1. He accessed the unit resources such as lecture slides and weekly worksheets more to support his learning and got more engaged in the forums such as in week 9 his forum activity was higher, probably it was near the assignment 2 submission and the quiz. Therefore, we can say that there is evidence that his engagement with the unit increased as a result of the alert email.



**Figure 4.26: Number of LMS Interactions for Group 2-Student 1 Who Received an Alert**

It was interesting to note that the student picked both *feel worse* and *feel like he can improve* in a question to identify the impact of early alert or intervention from the unit convenor on the respondent's motivation to continue in the unit. In a follow-up open-ended question to explain why he felt this way, he said, "*Initially it made me feel worse but then it motivated me to do better*". He also indicated that the email did help him to realise that he is falling behind and helped him to improve his study habits. In other questions related to the attitude towards being contacted and how he viewed his unit convenor after receiving an email, he marked that he appreciated that there was someone watching out for him, was grateful that

somebody contacted him about his academic standing in the unit and felt like the unit convenor was supporting him to do well.

#### **4.8.3.8.2.2 Group 2-Student 2**

Group 2-Student 2 was a full-time international female student in the 19-24 age group. Her first language was not English and was a first year-second semester student from the Science faculty. She was working 5-10 hours per week and would like to be contacted if her performance is unsatisfactory in a unit. Regarding the unit related information, she was doing the unit for the first time, had read the unit guide, completely understood the unit requirements and was very little prepared for the unit. She obtained a *Pass* grade in the unit.

She received an email from the unit convenor on 10/9/2015 (in week 7) for missing assignment 1:

*Dear STUDENT FIRST NAME,*

*How are you? I noticed that as of a couple of days ago, you hadn't submitted Assignment 1 for ISYS1XX. That assessment task is worth 18% of your total marks. Not only do you lose those marks by not submitting your solution, if you don't know the material about database modeling and using ER diagrams, you will not be able to pass Section B of the final exam.*

*I encourage you to catch up on the lecture and textbook material from Weeks 2-4 (workshops 3-5) and have a serious go at Assignment 1. If you get it in the next 10 days, we'll mark it to give you feedback, even though it is now too late to get the marks included in your final total.*

*If you are struggling with the unit content, you can visit HELP101 in Room X, see tutor consultation times. [link provided]*

*Remember that the Health and Wellbeing team are available to help you with welfare, counselling, medical, and any other non-academic concerns that you may have. Visit them at [link provided]*

*If you put in a special consideration for late submission, please get your submission in by the agreed date.*

*Please let me know if you need clarification over any matter in ISYS1XX.*

In the survey, she indicated that when she was contacted, she followed-up by setting an appointment for in-person meeting with the teaching staff. She also mentioned that it made her want to give up as her assignment 1 was already a late submission.

Table 4.48 shows the overall LMS interactions for the student and the mean values for each factor before and after the intervention email. The behaviour of LMS interaction for this student positively changed after the intervention, if we assume the increased login, forum and assessment activities are positive engagement with the unit. On average per week after the intervention, this student logged in 6.0 times

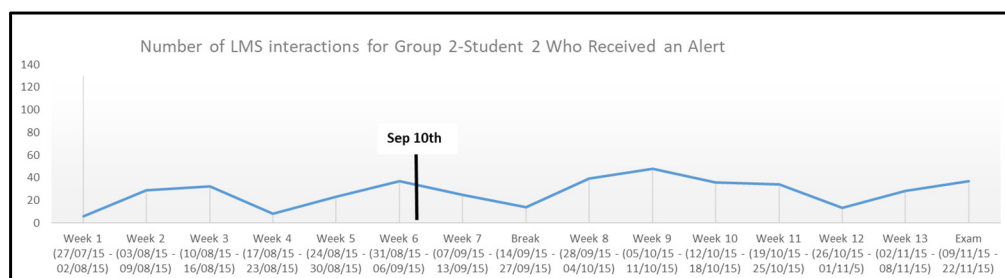
more, participated 2.2 times more in forum activities and engaged with assessment activities 0.1 times more compared to before the intervention.

**Table 4.48: Group 2-Student 2 Indicators Hits Summary Before and After the Intervention Email**

	Before the intervention			After the intervention			Change (After-Before)
Indicators	N	Mean (SD)	Median	N	Mean (SD)	Median	Mean
Login Activity	89	12.7 (5.38)	13	150	18.7 (7.25)	19	6.0
Forum Activity	15	2.1 (3.02)	1	34	4.3 (3.20)	4.5	2.2
Assessment Activity	56	8.0 (5.66)	9	65	8.1 (5.96)	6.5	0.1

*Note:* Before the intervention period is from week 1-week 7 (Total-7 weeks). After the intervention period is from Break-Exam period (Total-10 weeks). The total (N), mean (SD) and median are calculated as on the number of LMS interactions for the respective periods.

The intervention email that this student received in week 7 resulted in increased LMS interactions (Figure 4.27). She had completed the other assignments on time (before the due date). She accessed the unit resources such as lecture slides, weekly quizzes and worksheets more to support her learning and was viewing the discussion threads more. Therefore, we can say that there is evidence that her engagement with the unit increased as a result of the alert email.



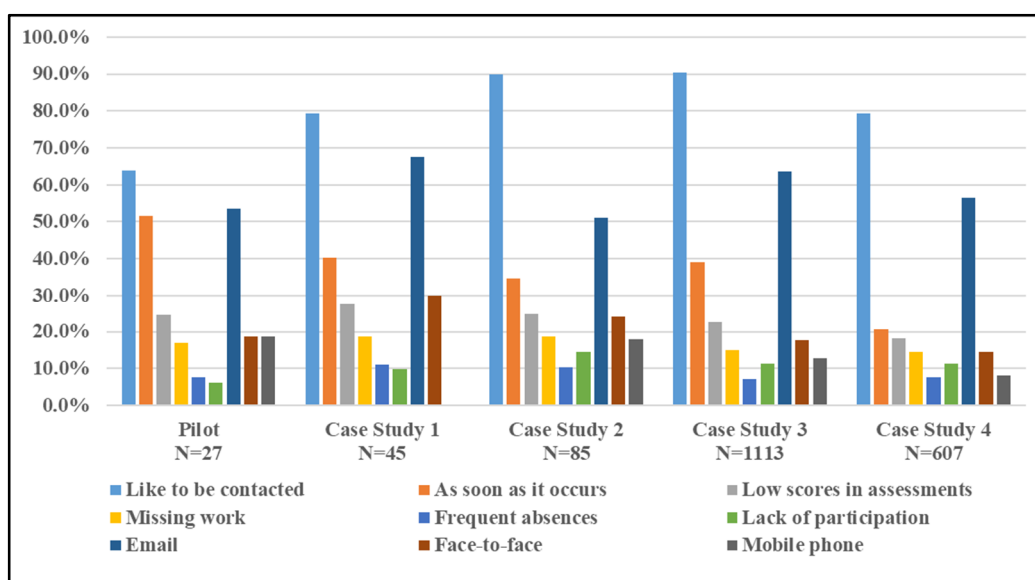
**Figure 4.27: Number of LMS Interactions for Group 2-Student 2 Who Received an Alert**

The student indicated that she was *feeling better* after receiving an email from her unit convenor. In a following open-ended question to explain why she felt this way, she said, “[the unit convenor] let me feel I can do it”. She also indicated that the email did help her to realise that she was falling behind. In other questions related to the attitude towards being contacted and how she viewed her unit convenor after receiving an email, she marked all options as neutral.

## 4.9 Student Perspective Discussion

Student academic success has become a pivotal focus of attention as institutions locate themselves in a competitive higher education environment. A number of factors such as diversity of abilities, age groups, gender, and educational backgrounds have contributed to the student academic success in higher education (Carey 2005; Kuh, Laird & Umbach 2004). All case studies included in this chapter sought to determine if there were external factors other than mentioned above (such as employment, unit preparedness, problems with daily travel) that made it difficult for them to succeed.

In a comparative analysis of the case studies (Figure 4.28), it was observed that the majority of students did want to be alerted, preferred to receive alerts as soon as their academic performance was unsatisfactory. Students' mostly wanted to receive alerts for low scores in assessments, missing work, frequent absences and lack of participation/effort. Furthermore, they strongly preferred to be alerted via email (university or personal), then face-to-face, then (mobile) phone. In all case studies, students doing different units in different faculties have the same positive attitude towards being contacted. All students appreciated the care and support offered to them.



**Figure 4.28: Comparative analysis of case studies regarding early alerts (whether a student wants to receive an early alert, when, how and in what form they want that alert to take)**

During the comparative analysis, each case study was compared with each other using the two-tailed z-test for nine items from the survey (as displayed in Figure 4.28). Because there were multiple comparisons (90), we have adjusted the p value by using ‘Bonferroni adjustment’ to avoid false discoveries. After adjusting the p values, we only observed three significant differences. These were for ‘Like to be contacted’ if their performance is unsatisfactory and ‘As soon as it occurs’ (when they like to be contacted). For ‘*Like to be contacted*’ (Case Study 3 proportion – Case Study 4 proportion = 0.11,  $SE^{28} = 0.0172$ ,  $z = 6.38$ ,  $p < 0.0001$ ) and (Pilot proportion – Case Study 3 proportion = -0.26,  $SE = 0.059$ ,  $z = -4.474$ ,  $p < 0.0001$ ). However, this could be related to small standard error due to large sample size of Case Study 3 since we observe similar proportional differences between other case studies (such as Case Study 2 and Pilot), the standard errors are larger, therefore, the difference is not statistically significant. For ‘*As soon as it occurs*’ (Case Study 3 proportion – Case Study 4 proportion = 0.18,  $SE = 0.0237$ ,  $z = 7.61$ ,  $p < 0.0001$ ). The differences could be related to the units that took part in each case study, the unit designs, delivery methods, assessments or student characteristics. Although we do not have data about most of the unit specific information, we can report that in Case Study 3 62% of the students were first year first semester while in Case Study 4 12.1% of the students were in this category. Therefore, it is possible that students in Case Study 3 needed as much help as they can get to enable their transition from high school to higher education.

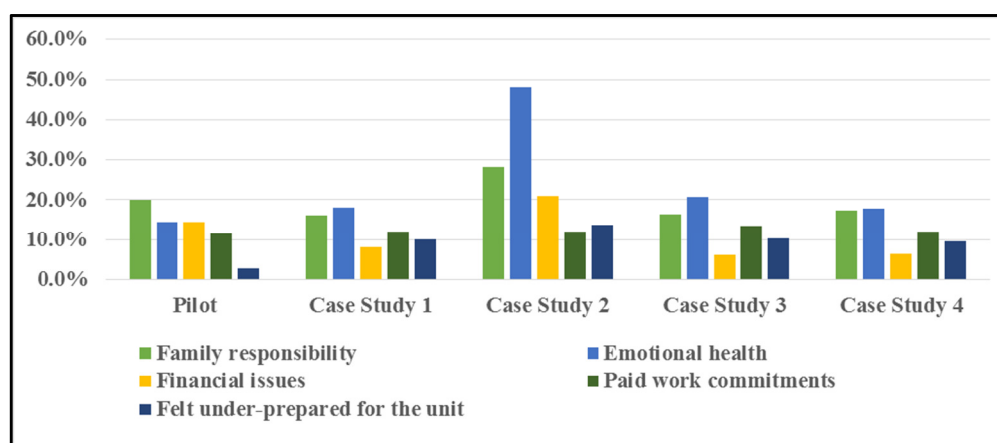
In the final study (case study 4), analysis of the demographics for those students who received alerts indicated that 33.4% of the students worked between 11-20 hours a week; 15.6% students worked more than 20 hours a week and 27.2% students were not working. From the analysis of the decision trees in section 4.8.3.6.1 it was found that the participating students who felt better after receiving an alert email followed-up with their unit convenors and were working between 5 to 20 hours a week. Students who were not working or working more than 20 hours/week did not follow-up with their unit convenors. This is consistent with the research that the academic performance of students who worked 10-19 hours per week was better to all other working (> 20 hours/week) and non-working students (Coates 2010b; Dundes & Marx 2006). Therefore, this suggests that lack of

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<sup>28</sup> Standard Error

academic success is more likely due to a problem relating to either the institutional environment (or logistical factor such as cost of study per unit, ease of access, flexibility in studying), the unit related learning and teaching approach, or a personal (such as cultural/religious orientation, specific learning needs, abilities/skills and prior experience) factors (Bailey et al. 2014; Lau 2003; Maher & Macallister 2013; Mushtaq 2012; Sternberg 2013; Zhang & Aasheim 2011).

To gain some insight on the possible factors they felt might influence their academic performance, students from all the case studies including the pilot who received alerts mentioned emotional health issues, family responsibilities, paid work commitments, financial issues and felt under-prepared for the unit. Figure 4.29 shows a relative analysis of the possible factors that influenced students' academic performance and eventually their academic success.



**Figure 4.29: Comparative analysis of case studies of the possible factors that influenced students' academic performance**

In case study 4, the grades of students who received an alert in a 100-level Information System unit ISYS1XX were compared using a one-way analysis of variance (ANOVA) at a 5% confidence level to test whether or not factors had an effect on student grade achieved. No significant difference was found,  $F(5, 551) = 0.393$ ,  $p > 0.05$ . This unit was chosen from the 17 units in this case study because the unit is offered within our department, thus we have access to the student grades.

Our review of the literature shows that there has been comparatively little attention paid at the importance of timing in determining the effectiveness of any intervention. Hattie and Timperley (2007), proposed a model of feedback/intervention that identifies the different levels at which the feedback can

be effective. The different levels were feedback about the task, about the processing of the task, about self-regulation and about the self as a person. This thesis includes research questions related to the timing of feedback/intervention (such as when and how students what to receive an alert) and the effects of positive and negative feedback (how students view their unit convenors after they have received an alert) and not the quantity of the feedback. A study conducted at the university of Newcastle, Sydney using attendance as an indicator of performance and academic success in the classes (practicals and seminars) pointed to the importance of providing (in the semester) intervention to the students (Bevitt, Baldwin & Calvert 2010). Again, receiving an email from a teacher saying that a student's academic performance is unsatisfactory or low encourages the student to address the issue directly with the teacher (Singell & Waddell 2010). These interactions develop the students' academic engagement to 'do more' or 'do better', potentially resulting in better retention rates. This is consistent with the results to our research questions about opinions and preferences of students with respect to when and how to receive early alerts (Figure 4.28). This is also consistent with research (Asby 2015; Bricknall, Iarossi & Grisdale 2017; Kuh 2009; Reddick et al. 2014; Sackers, Secomb & Hulett 2008) where students were contacted via email regarding their academic performance and the increased teacher-student interactions (via email) were identified as effective means of student persistence but we did not find any research where students were explicitly asked how they want to be contacted about their academic progress or to receive an intervention. However, using university email is also a very common method (Campbell 2007; Jayaprakash et al. 2014) besides phone calls and face-to-face meetings used by teachers and academic advisors or other support staff. Therefore, the earlier and more timely an intervention can be arranged, the more time a student has to address the problem and/or get engaged with the unit content.

When our results from the pilot and early case studies were presented to learning and teaching (L&T) groups within the university, including the Advisory Board on the Teaching Development Grant, there was some scepticism about the students' preference to receive alerts via their university email. Many assumed that being sent an SMS, phone call or email via a personal email account would have been preferable. A viewpoint commonly expressed across the institution by

administrators and academics was that students often did not read their university email. However, every case study confirmed the student preference for email to their university (or personal) account. Another unrelated survey conducted by central IT services, also received the response from students that their university email was their preferred method of communication. The challenge is therefore not to send too many emails and to make the email subjects meaningful. As we found in our use of email to send alerts, addressing the student personally made a big difference to their decision to read the email.

Though students preferred to be alerted via email, they did not want to resolve the matter via email. For preferences to seek help across all case studies, more students preferred to talk with the unit convener/lecturer/tutor to work out a plan to improve their grade(s). Campbell (2007) references Astin's theory of student involvement, which suggests that student-teacher interactions results in better academic performance and retention rates. Thus, the preference of students to speak to a teacher about their performance and strategies to address issues is also likely to achieve the desired outcome of improved performance and academic success.

Often institutions already have support services tailored to their student population needs. Many institutions offer student services, such as access to a writing and numeracy centre, employment, medical services, and campus wellbeing. Unfortunately, these services are often under-utilised by the students who could benefit from them the most (Tinto 2012). One way in which institutions can improve both the academic performance and student persistence is by encouraging student utilisation of campus support services. Research also suggests that there is a positive relationship between utilisation of campus support services and persistence to program or degree completion (Churchill & Iwai 1981; Pascarella, Terenzini & Feldman 2005). Moreover, students who seek and receive academic support have been found to improve both academic performance and their academic self-efficacy (Chemers, Hu & Garcia 2001; Pajares 1996; Schunk 1991). They develop a greater sense of self-perceived control of academic outcomes and develop higher self-expectations for future academic success (Smith, Lange & Huston 2012). Our analysis of the intervention impact to increase student motivation to utilise campus support services across all case studies shows that less than 50% of the participants were aware of the university support services.

interventions will connect existing services to students who may not even know they need these services. With this in mind, the email alerts were designed to encourage students to take advantage of the resources offered at their institution and designed specifically for that institution's student body. However, it has also been found that students under-utilise academic support services especially those students who are in most need of support. The variability of students' responses for some survey questions were large, indicated by moderately large standard deviations (for example section 4.7.2), which indicates students' perceptions of help provided by the student support services ranged from not helpful to helpful. In particular, it is the student at-risk who has trouble recognising that they are experiencing academic difficulty and are often hesitant to seek help (Fusch 2011; Kinnear et al. 2009). Educational institutions which triggers the individual contact with students retain more students than institutions that do not (Simpson 2005). From our findings of this study and in agreement with the literature, we suggest that educational institutions should provide academic support effectively by initiating contact with students and bringing support services to them rather than suggesting services and expecting that students will come and take advantage of them on their own.

Our findings are consistent with a comprehensive review of the research literature by Tinto (2012) and Miller and Murray (2005). According to them, institutions with low retention rates are those in which students generally report low rates of student-teacher contact, academically under-prepared, inadequate academic advising, and low motivation. On the contrary, institutions with high retention rates are often those which report relatively high rates of such interactions (Miller & Murray 2005; Tinto 2012). This may mean that sending alerts to students is not sufficient, but that there needs to be mechanisms in the early alert system to identify if people have read the alert and taken some action.

More learning analytics functions should be added to the early alert system to provide monitoring of improved attendance, on time submission of assessments or improved assessment marks. Also, reports to student support staff, program leaders, Head of Departments or other appropriate person flagging individuals who are falling behind in multiple units or not taking action can help the institution be more proactive. Such reports are planned in future versions of MEAP+.

Due to the complexity of each individual learner and the different contexts faced by individuals within an unit and across offerings of units, it is very difficult to demonstrate that an intervention is the cause of a change in student behaviour. Indeed not all interventions have a positive effect (Herodotou et al. 2017), Nevertheless in seeking to measure whether early alerts have improved student engagement and performance, we conducted analyses of pass/fail rates before and after using MEAP+ for those units where we had access to this information. Section 4.8.3.8 describes the behavioural analysis of students before and after receiving an early alert or intervention. We note that pass/fail rates did not significantly change. Though, some evidence was found in the student's behaviour that there was a positive impact on student engagement with the unit after the receipt of an email (section 4.8.3.8.2).

In many of the problematic units that were invited to join our study, convenors were already employing manual strategies to contact students. Sometimes this involved hiring special support staff to contact students. Prior to use of MEAP, often the convenor identified students at risk via their own manual methods, such as manual review of individual data in iLearn. We were not able to conduct a controlled experiment where some students received alerts and some did not for the same behaviours. This would have been unethical and unfair to those in the control group. The benefits perceived by unit convenors was the convenience and scalability of using an automated tool like MEAP+ to identify and contact students at risk.

## **4.10 Summary**

The motivation to carry out the student perspective study was sought to determine the opinions and preferences of students on their attitudes towards the early alerts and interventions. This chapter included a detailed data analysis exploring the five research questions related to this study (mentioned in section 4.1). Additionally, the data collection process, questionnaire design, its validity and reliability was discussed in the respective sections. An overview of the pilot and the timeline of the four case studies with their aims and participants was illustrated. We reported the results of all the case studies including the pilot in detail. We found that the students value the early contact from their unit convenor and the importance of early alerts. Majority of the students did want to be alerted, preferred to receive alerts as

soon as performance was unsatisfactory, mostly for low scores in assessments and strongly preferred to be alerted via email (university), then face-to-face, then phone. Moreover, majority of the students gave permission to access their demographic and academic data in iLearn or other university systems to be used to identify and send early alerts about their performance. More specifically, students report positive attitudes towards being contacted and early intervention and reported their change in behaviour after an alert was received.

The subsequent chapter will provide the teacher perspective study to fulfill the aim 1.5.1 (chapter 1) of this PhD research.

## **5 CHAPTER: THE TEACHER PERSPECTIVE STUDY**

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### **5.1 Introduction**

The development of learning analytics tools (Siemens et al. 2013) has provided a much needed foundation for the field. However, many of the tools have been developed without an explicit consideration of understanding the socio-technical aspects experienced by teachers actually using these systems to deliver interventions to students. The importance of a student early alert system (such as MEAP) that operates on unit-level data in a LMS could be considered a step towards providing the support and help for teachers to reach out to high-risk students while they are still enrolled in the unit. In our context, delivering timely intervention via a prototype student early alert system sought to provide teachers and student support staff (particularly those responsible for managing and monitoring student performance) with access to real-time insights into the performance of students including students who are at-risk. Timely intervention requires timely identification and action on the part of the teacher first and then the student. The prototype student early alert system that we trialled in our study aimed to provide timely intervention. Use of early alert systems and similar tools can be a significant help in the planning of teaching activities or ways that would encourage students to change their behaviours. Some recent research has identified that effective teacher to student interventions improve students readiness to study, increase personal communication with students, offer early identification and intervention for at-risk students, enhance the quality of the learning experience, boost student engagement and quality of the higher education experience (Kennedy et al. 2014; Tinto 2012).

The aim of this chapter is to develop a greater understanding of teachers' perceptions of the early alert process and the use of a student early alert system to aid the process. Knowing the teachers' perspective is important because if teachers' are not favourable to the concept of an early alert system and if the barriers are too high, then they would not use such a system, even if benefits are perceived.

The research was guided by the following research questions:

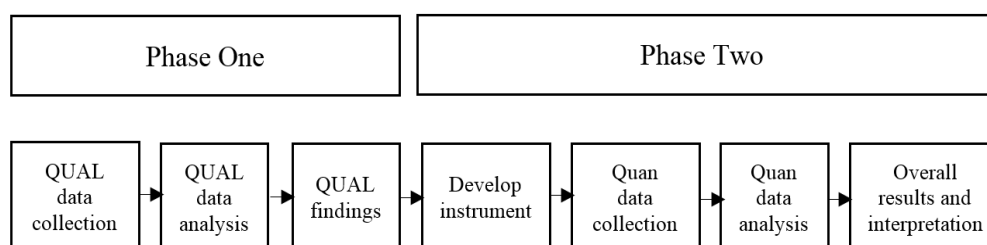
- What are the perceptions of teachers with respect to early alerts?
- What information would the teaching staff find meaningful to include in a student early alert system?
- What are the potential barriers to early alert system usage?
- What are the experiences and motivations of teachers with regard to usage, helpfulness and barriers/challenges to the use of a prototype early alert system?

The purpose of the study presented here was to investigate the perspectives of teachers regarding early alerts, the potential and challenges of a prototype system using institutional LMS data to improve the engagement and academic success of students within a unit. This chapter will provide a detailed discussion of the teachers' perspective and analysis of the data collected. The following section describes in detail the design of the teacher perspective study to answer the above research questions.

## 5.2 Teachers' Perspective Study-Mixed Methods

### Sequential Exploratory Design

This study used the taxonomy development model of exploratory sequential mixed methods (Creswell & Clark 2007). In mixed methods, the advantage of using sequential design over concurrent design is that sequential designs use analysis of one form of data to inform the collection of the second form of data (Morgan 1998; Myers & Oetzel 2003). The sequential process of this study is graphically represented in Figure 5.1.



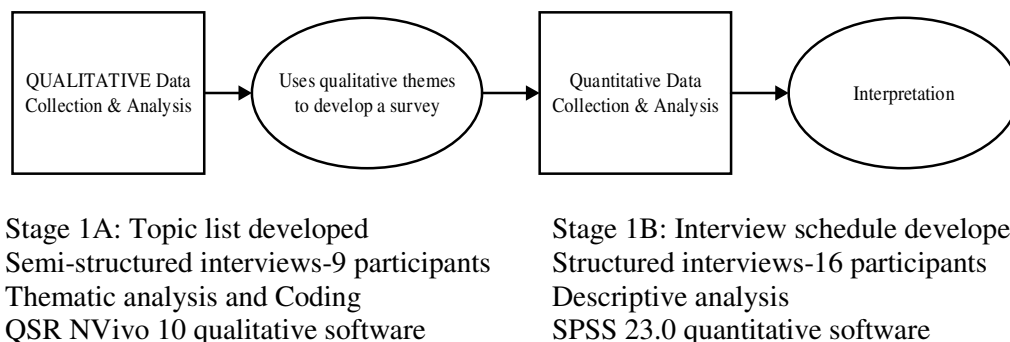
**Figure 5.1: Graphical representation of mixed methods sequential exploratory design**  
(adopted from Creswell & Plano Clark, 2007)

During session 1 and session 2 of 2015 academic year, a mixed-methods sequential exploratory study of the teachers' perspective was undertaken. The study design

consists of two different phases: *qualitative* followed by *quantitative* (Creswell 2013). In this mixed-methods design, a researcher first collects and analyses the qualitative data whose findings are tested in the second quantitative phase. The justification to use this approach is that the qualitative data and their following analysis provide a general understanding of the research problem (exploratory). The quantitative data and their analysis further test (confirmed) those qualitative results by exploring participants' views in more depth (Bergman 2008; Bernard 2012; Cameron 2009; Creswell 2013; Tashakkori & Teddlie 1998). The pros and cons of this mixed-methods design have been widely discussed in the literature (Cameron 2009; Creswell 2013; Ivankova, Creswell & Stick 2006). Its advantages include the following: (1) the individual phases make the design easy to describe, apply and report and (2) the inclusion of the quantitative component makes qualitative approach more acceptable to quantitative-biased audiences. The limitations of this design are that it requires substantial amount of time to implement and analysis of the qualitative data must conclude with findings contributing to later stages.

Due to the paucity of research in this area, the first stage (1A) was designed to be exploratory and involved capture of qualitative research interview (King & Horrocks 2010) data from staff in the roles of unit convenor, teaching staff or student support staff (N=9). In the context of our institution, a unit convenor is a member of academic staff responsible for managing and monitoring the academic activities and performance of the enrolled students in a unit. At other institutions they may be referred to as unit or course coordinators. At our institution, teachers in units with very large classes receive assistance from student support staff in the monitoring and support of their students. Thus, student support staff were also users of our prototype early alert system and part of this study. The second stage (1B) used the output from 1A to develop a predominately quantitative instrument that was administered as a structured interview to a comparatively bigger group (N=16) of academic and student support staff. The study in the second stage not only increased the number of teacher viewpoints captured to answer our research questions, the use of a survey with answer options, rather than open-ended free text, required less interpretation by the researchers and enabled the use of statistical analysis methods.

In the Stage 1A, the researchers used a qualitative method (interview protocol) to explore teachers' perspectives regarding the benefits and barriers to the use of early alert systems (Figure 5.2). The priority of this stage is indicated by capitalising the term QUALITATIVE (Morse 2003). The exploratory results from phase one builds to a second quantitative phase to generalise the initial findings (from the interviews).



**Figure 5.2: A visual model of our mixed methods sequential exploratory design**

In Stage 1B, the researchers developed a survey instrument that builds on the qualitative results and is used in the later quantitative data collection. For that reason, this design has also been referred to as the quantitative follow-up design (Morgan 1998).

### 5.2.1 Ethical Considerations

In order to invite the teaching staff to participate in the study it was necessary to seek ethical clearance from the Human Research Ethics Committee (HREC) of the university. Approval was obtained for the research to commence on March 2, 2016 (Number 5201500031). A copy of the ethics clearance can be found in Appendix A.

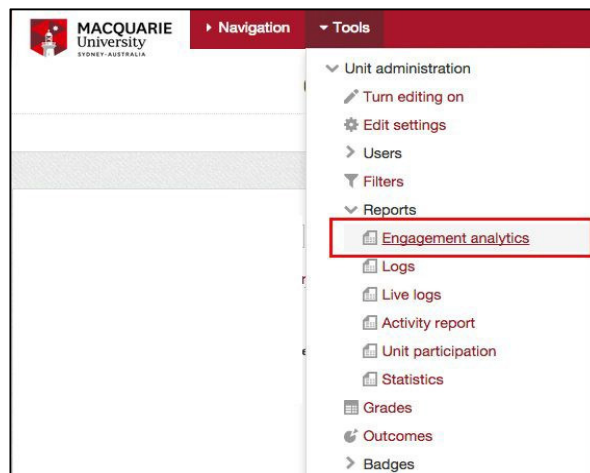
In this teacher perspective study, potential participants were send an email to take part in a one-hour interview to participate. It is important to clarify that an invitation to participate in an interview was not distributed across the university, but targeted to individuals who had either expressed interest in using an early alert system or who had been identified to us. Prior to this phase, the Associate Dean Learning and Teaching for each faculty and other leading teaching representatives were contacted to identify who was likely to be willing not only to complete a one-hour interview, but to participate in a semester long study that would involve training on the

Moodle-based learning analytic plugin MEAP (Moodle Engagement Analytics Plugin), also known as Moodle Engagement Block (MEB) system. Additionally, regular follow-up by the research team, use of the MEAP system, and various interaction with MEAP, students and tutors regarding setting of thresholds, regular identification of students at risk and handling MEAP interventions and follow-up were expected from the participants. We will discuss the reasons and possible associated limitations related to the teacher perspective study in the final chapter of this thesis.

The participants used the MEAP with blended and fully online units in Semester 1 and Semester 2 2015 to trial its usefulness in informing unit convenors, and possibly student support staff, of students at risk of not completing their unit successfully. Teacher needs, attitudes and preferences were gathered concerning the use of early alerts. An information and consent sheet was presented to each interviewee prior to their interview. A copy of the participants' information and consent sheets can be found in Appendix B. Interviewees were subsequently provided with a copy of the information and consent sheet to retain for their records.

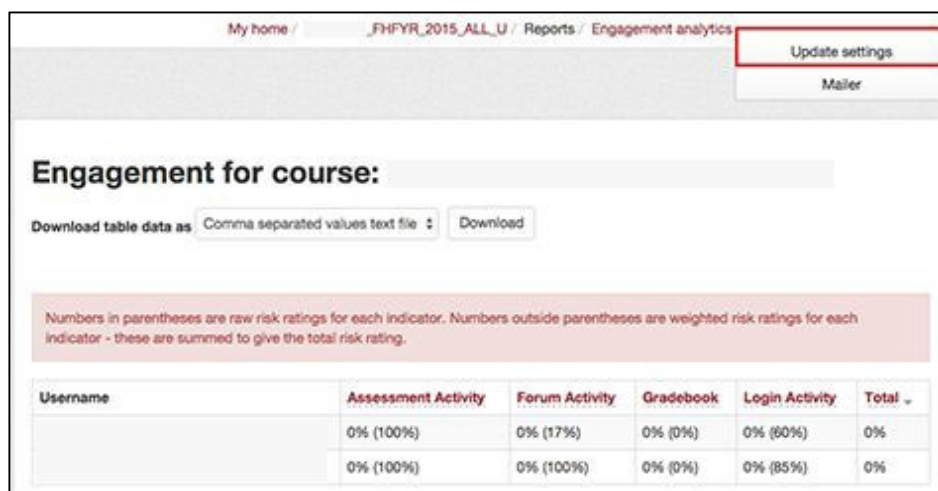
### **5.3 Illustrative Study-A Prototype Student Early Alert System**

To ground the study and provide teachers and student support staff with a point of reference, the questions in our interviews and surveys were designed in the context of an LMS based prototype student early alert system. The prototype student early alert system was designed and deployed at our institution (Figure 5.3).



**Figure 5.3: A screenshot of the prototype student early alert system (MEAP)**

Initial validation using historical data from three introductory (first-year) undergraduate units, was used to show that risk ratings calculated by MEAP could be correlated with students' final grades (Liu et al. 2015b). A design-based research approach was then used, where we examined the experience of students and teachers with MEAP, together with its impact on student retention and learning. MEAP was enhanced and extended so that a new indicator (Gradebook) and an additional assessment type (Turnitin) could be used (now known as MEAP+). This improved its ability to identify students at risk of not completing their units. MEAP calculates the at-risk percentage for all the students in a unit as shown in Figure 5.4.



**Figure 5.4: A screenshot of MEAP+ showing the indicators**

In “update settings” as in Figure 5.4, all four indicators or any combination of them can be used. Depending upon the unit design, the unit convenors can weight these indicators (Figure 5.5).

▼ Weighting

Indicator		
Assessment Activity	<input type="text" value="25"/>	%
Forum Activity	<input type="text" value="25"/>	%
Gradebook	<input type="text" value="25"/>	%
Login Activity	<input type="text" value="25"/>	%

### Figure 5.5: Indicator Weightings

Within these indicators, the unit convenors can set the thresholds (or benchmarks) to calculate a risk score for students in their unit (Figure 5.6 - 5.9).

▼ Assessment Activity

Overdue Grace Days

0

Overdue Maximum Days

14

Overdue Submitted Weighting

50

%

Overdue Not Submitted Weighting

100

%

### Figure 5.6: Assessment Activity Thresholds

▼ Login Activity

Expected logins in the past week

2

Weighting

20

%

Expected logins per week

2

Weighting

30

%

Expected average session length (seconds)

600

Weighting

10

%

Expected time since last login (seconds)

604800

Weighting

40

%

Session Length (seconds)

3600

### Figure 5.7: Login Activity Thresholds

▼ **Gradebook**

At risk if the following condition(s) are met:

[Category] quizzes (0.0-30.0)	<input type="checkbox"/>	less than <input type="text"/>	out of 30.0   Weighting <input type="text"/>	%
[Category] Essay – Academic Resources (0.0-30.0)	<input type="checkbox"/>	less than <input type="text"/>	out of 30.0   Weighting <input type="text"/>	%
[Category] Individual Research Project (0.0-30.0)	<input type="checkbox"/>	less than <input type="text"/>	out of 30.0   Weighting <input type="text"/>	%
[Category] Participation (0.0-10.0)	<input checked="" type="checkbox"/>	less than <input type="text"/>	5 out of 10.0   Weighting <input type="text"/>	100 %

**Figure 5.8: Gradebook Activity Thresholds**

▼ Forum Activity

New posts per week	No Risk	<input type="text" value="0.5"/>	Max Risk	<input type="text" value="0"/>	Weighting	<input type="text" value="12"/>	%
Read posts per week	No Risk	<input type="text" value="1"/>	Max Risk	<input type="text" value="0"/>	Weighting	<input type="text" value="12"/>	%
Replies per week	No Risk	<input type="text" value="1"/>	Max Risk	<input type="text" value="0"/>	Weighting	<input type="text" value="20"/>	%
Total posts per week	No Risk	<input type="text" value="1"/>	Max Risk	<input type="text" value="0"/>	Weighting	<input type="text" value="56"/>	%

### Figure 5.9: Forum Activity Thresholds

The prototype had a mailer component that could also deliver customisable and personalisable intervention emails (Figure 5.10).

Select message type(s)				Data						
Asses.	Forum	Grade.	Login	Username	Assessment Activity	Forum Activity	Gradebook	Login Activity	Total risk	Msgs sent
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[REDACTED]	14 overdue 0 submitted	0 read posts 0 posted	100% risk 3 triggered 0 not triggered	87 days since last login 3.2 logins per week	91%	2 44 days ago
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[REDACTED]	13 overdue 1 submitted	0 read posts 0 posted	100% risk 3 triggered 0 not triggered	85 days since last login 3.8 logins per week	88%	1 49 days ago
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[REDACTED]	6 overdue 8 submitted	26 read posts 0 posted	100% risk 3 triggered 0 not triggered	9 days since last login 5.2 logins per week	76%	2 44 days ago
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	[REDACTED]	10 overdue 4 submitted	32 read posts 5 posted	100% risk 3 triggered 0 not triggered	8 days since last login 4.1 logins per week	71%	0
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[REDACTED]	11 overdue 3 submitted	0 read posts 0 posted	70% risk 2 triggered 1 not triggered	42 days since last login 2.7 logins per week	70%	2 44 days ago

**Figure 5.10: A screenshot of MEAP+ showing the mailer component**

Emails could be composed from suggested snippets (Figure 5.11) that provided short, specific, formative advice and all sent emails were logged to maintain a record of student contact (Liu et al. 2015a).

Message subject ?

Message body ?

Dear {#FIRSTNAME#},

I've noticed that you haven't been submitting your assignments [online](#) or accessing [iLearn](#) for a while. I just wanted to touch base and see if everything was OK with the unit, and whether we could work together to help you catch up.

Kind regards,  
[Your name here]  
[Building] [Room]  
[Other contact details]

Message snippets ?

Suggested snippets ▼

**Assessments**

Be sure to complete [assignments, assessments] in [\* name of LMS \*] on time to earn the most points possible.
In order to receive full credit for the online discussion board, you must post more than a few words in your replies to classmates.
Make sure to review the content pages posted in [\* name of LMS \*] such as [lecture notes, PDF's, PPoints, web links]

**Figure 5.11: A screenshot of MEAP+ showing how to send an email from suggested snippets**  
MEAP was extensively extended to monitor students' engagement behaviours (in a single unit) in the LMS on a range of indicators: including assessment

submissions; forum interactions (are students reading and/or posting?); login metrics (how often, how recently, and how long are students logging in?); and gradebook data (Liu et al. 2015b). Stage 1A (qualitative) was conducted prior to implementation of the mailer component. Feedback from Stage 1A was used to guide the design of the mailer. Stage 1B (quantitative) included both the identification and mailer features of the plugin. The update of the prototype with Stage 1A and 1B findings adds a design-based research element to the larger project reported in other publications (Liu et al. 2015a; Liu et al. 2015b; Liu et al. 2016). Further readings on how to interpret MEAP and MEAP+ user guide could be found in Appendix G.

## **5.4 Qualitative Data Collection and Analysis (Stage 1A)**

The goal of the qualitative Stage 1A was to explore the perceptions of teachers with respect to early alerts and their experience with using the MEAP, how they currently and/or would like to identify if students are falling behind and how they do/might contact them. The participating teaching staff trialled MEAP in their respective iLearn unit(s) in Semester 1 2015 to help identify and contact students that are at risk of disengagement. In this teacher perspective study, participants were recruited via an invitation email to participate in a one-hour each Initial and Follow-up interview. The Initial and Follow-up interview questions can be found in Appendix H. The process involved one-on-one induction training with unit convenors on using the MEAP+ followed by answering the set of questions from the Initial interview. Appendix G shows an example of what was discussed in the teacher training. The research team continued to meet with and contacted the teaching staff throughout the semester (approximately every four weeks) to see how they were going with MEAP+ and also determine if they were sending any early alerts to their students. If they were sending alerts, in a Follow-up interview we sought to determine the nature of these alerts (how many, when, the trigger, the content).

### **5.4.1 Interview Guide Development and Pilot Testing**

During the Stage 1A in this study, *semi-structured interviews* with the teaching staff were carried out at our institution in the first semester of the 2015 academic year. Guided by research questions presented in the chapter 1, a *topic list/interview guide*

for research questions related to teachers' perspective in Aim 1.5.1 was prepared. Questions were designed to explore the perceptions of teachers with respect to early alerts and what information would the teaching staff find meaningful to include in a student early alert system and the potential barriers to early alert system usage, experiences and motivations of teachers with regard to usage, helpfulness and challenges to the use of a prototype early alert system (Aim 1.5.1). Pilot testing of the interview guide was performed with two unit convenors (one from the Faculty of Science and Engineering and the other from the Faculty of Business and Economics) and a student support staff member from the Faculty of Business and Economics. Modifications were made to the interview guide based on researchers' experience and feedback from pilot participants. The final interview guide used in the study is presented in Appendix H. Interviews were audio-recorded and data from all interviews were transcribed before it was imported to the NVivo for the coding process. Though NVivo allows transcription, we chose the interviews to be transcribed externally by using Microsoft (MS) Office Word for a number of reasons such as NVivo accepts documents saved under .doc extension and auto-coding can be done using headings available in MS Word.

The method of analysis chosen for this study was thematic analysis, which is presented next.

#### **5.4.2 The Use of Thematic Analysis**

Generally thematic analysis is the most widely used systematic approach (not a research method) to the analysis of qualitative data (such as interview transcripts, field notes, research memos, digital audio files etc.). Braun and Clark (2006, p. 79) define thematic analysis as, "a method for identifying, analysing and reporting patterns (themes) within data". It is a form of pattern recognition (themes) within the data. A theme is a thought or subject which captures the main idea of the data related to the research question into categories. Themes within data can be identified either in an inductive (bottom up) way, a deductive (top down) way or hybrid way (combines inductive and deductive).

Interview data for this part of the research was analysed using an inductive thematic analysis where a rich thematic description (Boyatzis 1998; Patton 1990) and exploratory orientation of the topic was sought. Inductive thematic analysis is

typically data-driven and so has some similarities with grounded theory (Price & Kirkwood 2014). An inductive approach was chosen because: (1) the area under investigation was under-researched, and (2) little was known about the views of the particular participant group (academic staff) on this topic.

For this study we used the rubric to do the thematic analysis adapted from Braun and Clarke (2006). Table 5.1 summarises the different phases in thematic analysis for this study.

**Table 5.1: Thematic analysis steps for this study. Adapted from Braun and Clarke (2006)**

	<b>Phase</b>	<b>Description</b>
1	Familiarising yourself with the data	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2	Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3	Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
4	Reviewing themes	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic ‘map’ of the analysis.
5	Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6	Producing the report/write up	Relating the analysis to the research question and literature and producing a report of the analysis.

A qualitative data analysis technique known as *coding*, in line with Reeves (2006), Cohen et al. (2013) and Flick (Flick 2009), was applied to analyse responses to questions in Appendix H. The intention of coding was to link the identified themes to the data and not to try and fit the themes into a pre-existing coding scheme. The transcripts were reviewed and analysed by the first author (R1) using the three levels of coding such as open coding, axial coding and selective coding. *Open coding* is the first attempt of labelling segments of text to categorise them in the form of concepts. *Axial coding* is the reviewing of the data to revise the concepts identified through open coding and organise them into themes. *Selective coding* is identifying core categories of data based on the aims of the study and the themes that emerged in the interviews. The research team, comprising 4 researchers, collaborated during the coding phases to reach to a commonly decided coding scheme.

Thematic analysis was performed using the NVivo 10 (QSR International) Computer Assisted Qualitative Data Analysis Software (CAQDAS) specially designed for thematic analysis of qualitative data with theory-building capabilities. The researchers chose to work with NVivo 10 to ease data management and data analysis processes (such as coding, linking and searching), use of the 'node tree structure' to collate concepts into nodes.

As a first step in coding, the responses (transcribed interviews) were queried to determine the 50 most popular keywords with a minimum word length of 4 characters by 'word frequency' allowing some clustering of similar terms by adjusting the 'grouping slider' to half way between similar and exact. Examples of most frequent keywords that related directly to the use of student early alert system included 'triggers', 'motivation', 'features', 'concerns', 'alert', 'content' and 'usage'. The open coding phase helped to classify the perceptions of teachers with respect to early alerts into preliminary concepts (categories). These included themes such as triggers, motivation (for using student early alert system), usage, features, concerns/barriers and early alert content. The axial coding phase reviewed the preliminary concepts from the open coding phase and involved an analysis of categories into (main) themes. The three main themes emerged were '(dis)engagement triggers/identifiers', 'student early alert system', and 'actions/responses'. The selective coding phase assisted to revisit the responses that may not have been representative but are related to the aims of the study such as the potential of perceived benefits of student early alert system rather than delivering the timely interventions. Following the selective coding phase, the research team collaborated during the analysis in order to develop a mutually agreed coding scheme.

The results of the coding process are presented in section 5.6.1.

#### **5.4.2.1 Assessing Qualitative Validity**

Among the various approaches suggested by researchers for the qualitative research, Lincoln and Guba's (1985) criteria is used for the validity of the qualitative data as mentioned in section 3.3.

##### **5.4.2.1.1 Confirmability**

Confirmability refers to, "the degree to which the results could be confirmed or corroborated by others" (Kirk & Miller 1986). In general, it queries how the research findings are supported by the data collected (audit trails). The two strategies employed to enhance the confirmability of this teachers' perspective study. These were the recording and retention of all materials used in the study (interviews etc.), and inter-coder checks (Lincoln & Guba 1985) where coded teachers' perceptions of the early alerts data were reviewed by 3 other researchers familiar with the student early alert system and early interventions at the later iterations of coding to confirm the author's understanding and coding decisions.

##### **5.4.2.1.2 Credibility**

Credibility refers to, "the richness of the information gathered, rather than the amount of data gathered" (Maxwell 1992). Data triangulation techniques comparing multiple sources of data were used to enhance the credibility of this teachers' perspective study findings. This study evaluates numerous data sources and triangulates recorded interviews, transcribed interviews, communication with the teaching staff (emails), and (structured) survey data to give credibility to the results.

##### **5.4.2.1.3 Transferability**

Transferability refers to, "the degree to which the results of qualitative research can be generalised or transferred to other contexts or settings" (Shenton 2004). As mentioned earlier in this chapter, the second quantitative phase is done to generalise the initial findings from the interviews. Due to the selection of teaching staff using a particular criterion (selected sampling), this study did not seek to be representative of all teaching staff and units across all faculties (i.e. statistical generalisation); it did however seek analytic generalisation (Yin 2013). Analytic generalisation allows

the results to be generalised at a conceptual level and as a result be applied to other (theoretically similar) situations and contexts.

#### **5.4.2.1.4 Dependability**

Dependability refers to, “the stability and consistency of the measures, research process, procedures and methodological techniques applied” (Lincoln & Guba 1985). In this study, dependability was strengthened through the research design (including the operational detail of data gathering) and process including recording and retaining all data (e.g. interviews, recordings, transcripts).

#### **5.4.2.2 Assessing Inter-Coder Reliability**

Generally with thematic analysis, reliability is of more concern as compare to other qualitative analyses because more interpretation goes into defining the data items (such as codes). Assessing reliability is of more concern when working in teams with multiple analysts. To maintain rigour, approaches for monitoring and improving inter-coder agreement should be implemented in the analytic process (Carey, Morgan & Oxtoby 1996; Krippendorff 1980). The commonly used ‘coefficient of agreement’ also known as Cohen’s kappa (Cohen 1968) can be used to increase the reliability. The kappa measure can range from -1 to 1, with 1 indicating *perfect agreement* and 0 indicating *no agreement*. In the study presented in this chapter, we used fairly rigorous cut-offs at kappa  $\geq 0.80$  or 0.90 (Table 5.2).

### **5.5 Quantitative (Survey Interview) Data Collection and Analysis (Stage 1B)**

The goal of the quantitative Stage 1B was to capture data from more participants and analyse it more objectively and quickly. We collected the data via a web-based *structured interview* (also known as standardised interview or a researcher-administered survey) using Qualtrics (<http://www.qualtrics.com>) (Qualtrics 2014). According to Blackstone (2012), “the difference between surveys and standardised interviews is that questions and answer options are read to respondents rather than having respondents complete a questionnaire on their own” (Blackstone 2012). The questionnaire consisted of items that required answers for binary (yes/no), open ended, multiple choice and Likert scale questions. In survey interviews, we have used an *interview schedule* rather than a topic list/interview guide to read answer

options to the interviewees (Appendix H). An *interview schedule* is defined as, “a document that contains the list of questions and answer options that interviewers read to respondents” (Blackstone 2012). The interview schedule used for this stage contains both closed and open-ended questions. The survey items were developed from themes identified in the interviews (Stage 1A) and from a review of the current literature on using learning analytics tools to predict and improve student academic success (Arnold & Pistilli 2012; Barber & Sharkey 2012; Dietz-Uhler & Hurn 2013; Essa & Ayad 2012b; Verbert et al. 2013). The quantitative interview data collected from sixteen participants were recorded. Beside demographics, topics covered in the survey were based on the qualitative analysis of interviews (Stage 1A) and included benefits, usage, helpfulness, and difficulties/challenges to the use of a prototype student early alert system. In a team review, we finalised the content validity of the survey items. The questions are provided in Appendix H. The survey interviews with academic staff in the roles of unit convenor, teaching staff or student support staff were carried out at our institution in the second semester of the 2015 academic year. We used the same criteria for unit selection as in the qualitative phase. Interviewees were recruited via an invitation email to participate in a 30-45 minutes’ survey interview. SPSS 23.0 was used for quantitative data analysis.

## **5.6 Results**

### **5.6.1 Qualitative Phase: Stage 1A**

The interview sample for this study included nine unit convenors including 3 females and 6 males. The unit convenors were recruited from nine large (100+ students) undergraduate units (6 first-year and 3 second-year) at our institution from four faculties: Arts (3), Humanities (1), Business and Economics (1) and Science and Engineering (4) units, delivered in either an online or blended mode. These units were selected because they had a relatively high number of at-risk students (at least 10% fail rate) in the previous study period and they used a range of online activities in their LMS (such as forum posts and assessment tasks). Unit convenors were mostly mid and late-career academics, however, no demographics were collected. Coding themes were proposed by three researchers (R1, R2, R3) separately, based on the full set of interviews. The researcher (R4) collated and

reviewed (by renaming of synonyms and removal of duplication) the three sets of coded data to clarify relationships (such as ‘is-a’, ‘is-part-of’).

After a team review, R1-R3 used the coding scheme to cross-code one randomly chosen transcript to check the inter-coder/independent agreement (Tinsley & Weiss 2000). For this study, Cohen’s (1968) Kappa values were used in order to estimate the inter-rater reliability of interviews. The Kappa value was calculated using the coding comparison queries in NVivo 10. Table 5.2 shows the inter-coder agreement between the three researchers. These values reflect high strengths of agreement and reliabilities of interviews. It was not deemed necessary to do further cross-coding.

**Table 5.2: Kappa coefficient values and value of agreement between the researchers**

<b>Researchers</b>	<b>Agreement (%)</b>	<b>Kappa coefficient</b>	<b>Interpretation</b>
R1-R2	99.69	0.901	Almost perfect agreement
R1-R3	99.67	0.899	Strong agreement
R2-R3	99.96	0.987	Almost perfect agreement

The finalised generated codes were applied to all transcripts by R1. At the end of the coding process, the researchers had found 3 *main themes*, 18 *first-order*, and 73 *second-order sub-themes* (Table 5.3).

**Table 5.3: Main themes and sub-themes from semi-structured interviews**

	<b>Main Themes</b>	<b>Sub-Themes (1<sup>st</sup> Order)</b>	<b>Sub-Themes (2<sup>nd</sup> Order)</b>
1	Student Early Alert System	<p>Motivation to use</p> <p>Frequency of usage When to use?</p> <p>Features</p> <p>Challenges</p>	<p>Contact at-risk students (6), identify at-risk students (4), understanding how students work (3), help as a program director (2), identify level of engagement (2), as indicator only (2), duty of care (2), provide checkpoint (2), address high failure rates (1), address falling enrolments (1), FYFS (first year-first semester) retention (1), identify online activity (1), validation of unit design (1), change student attitude (1), change student behaviour (1)</p> <p>Weekly (6), daily (2),</p> <p>Assessment tasks due (3), after semester (3), census date (2), before major events (2), halfway (2), throughout (1), after first third of course (1)</p> <p>Large scale coverage possible (1), uses available data (1), automatic detection and alert (1), efficient/time saving (1), personalisation (1), differentiation (1)</p> <p>Workload (10), interpretation of results (8), choosing benchmarks and weightings (4), learning new interface (2), false alerts (2), algorithm (1), improving accuracy (1), (lack of) confidence in reliability and validity (1), understanding how it works (1), what to suggest (1), not useful/ineffective (1), bombarding students (1), students not reading alert or taking action (1)</p>
2	Engagement Triggers Or Identifiers	<p>Final exam Assessment submissions</p> <p>Gradebook</p> <p>Forum Logins Assessment types Access resources Class attendance</p> <p>Contact</p>	<p>Attendance (1), mark (1)</p> <p>Late (1), missing (6), incomplete (1), repeated attempts (1)</p> <p>Grade/mark (1), inconsistent (1), declining (1)</p> <p>Posts (1), reads (1)</p> <p>Frequency (4), duration (2),</p> <p>Assignment (6), quiz (3), tutorial tasks (2),</p> <p>Watching videos (1), reading (1), downloading (1), duration (1)</p> <p>Lectures (5), tutorials (5), workshops/practicals (5)</p> <p>Via email (8), initiated by (3), with academic and support staff (2), content (1)</p>
3	Actions	<p>Send alert Ring Announcement Nothing/No action</p>	<p>Alert content (6), alert medium (5), recipient (1)</p>

The following extracts (Tables 5.4, 5.5, 5.6 and 5.7) from the interviews exemplify some of the themes in Table 5.3. The motivation to use the prototype student early system was extracted and reported for the following reasons (Table 5.4).

**Table 5.4: Sample Quotes for Sub-Themes (1st Order) ‘Motivation’ showing the Sub-Themes (2nd Order)**

<b>Participant/Discipline</b>	<b>Quote</b>	<b>Sub-Themes (2<sup>nd</sup> Order)</b>
Male (Biology)	It will help me to identify students at risk quickly and that’s good because at the moment it’s something that I have to do relatively by hand.	Identify at-risk students
Female (History)	Focus on student retention...that’s a big thing that we see particularly in our first year first semester (FYFS) units. Last year we had quite a big drop in who would enrol and then how many actually stayed in the unit and therefore who actually transitioned as well into our 200 level units.	FYFS (first year-first semester) retention
Male (Economics)	Well, I think this will be another significant tool and save some time to identify who are the students at risk and, hopefully again, by getting in contact with them to keep them in the unit.	Contact at-risk students; Identify at-risk students
Female (International Studies)	I’d be interested in seeing for the students who aren’t participating in the forum I think I’d be interested in seeing what else they are participating in because I find that there’s a range of participation.	Identify level of engagement; Identify online activity

The barriers or challenges in the use of early alert system did not feature foremost in developing innovations with technology (algorithm or learning new interfaces). More often, participants spoke about choosing benchmarks and weightings, interpretation of results, (lack of) confidence in reliability and validity (Table 5.5).

**Table 5.5: Sample Quotes for Sub-Themes (1st Order) ‘Barriers/Challenges’ showing the Sub-Themes (2nd Order)**

<b>Participant/Discipline</b>	<b>Quote</b>	<b>Sub-Themes (2<sup>nd</sup> Order)</b>
Female (History)	...certain weightings on what I think is important for them but maybe my expectations of them might not be realistic.	Choosing benchmarks and weightings
Male (Economics)	I might envisage this, those weightings that I gave, and I could be totally wrong.	Choosing benchmarks and weightings
Male (Computing)	I think that would be interpreting the results and how to make them usable for future modifications.	Interpretation of results
Male (Psychology)	I would only be resistant to using it if I didn’t believe in the results it produced or if I couldn’t accept the results that were produced.	Confidence in reliability and validity

Teachers were asked how they determine that students need to be contacted or they were falling behind. Many of them highlighted the non-submission of assessment tasks followed by late submission of assessment tasks, non-attendance at lectures and tutorials/workshops and not logging to iLearn (Table 5.6).

**Table 5.6: Sample Quotes for Sub-Themes (1st Order) ‘Engagement Triggers/Identifiers’ showing the Sub-Themes (2nd Order)**

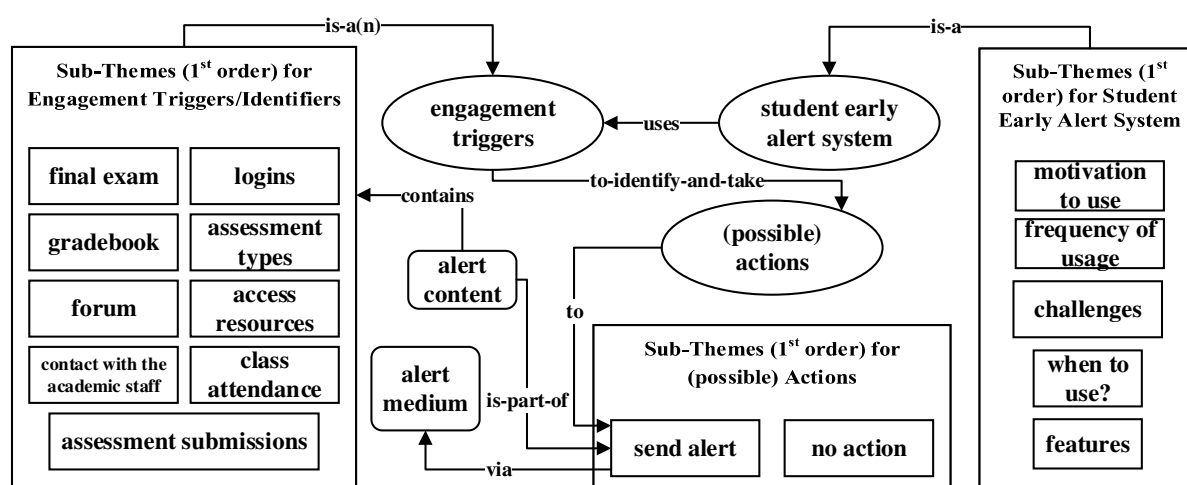
<b>Participant/Discipline</b>	<b>Quote</b>	<b>Sub-Themes (2<sup>nd</sup> Order)</b>
Male (Psychology)	Other times it’s when people ask for extensions. They’re indicators that they’re falling behind.	Late submission of assessment tasks
Female (International Studies)	I check the logs. Well the first thing I do, the online discussion is weekly and I assess that the day after it’s due and I dip in before it’s due to see how things are going.	Login frequency and duration; Forum posts and reads
Male (Biology)	The most effective variable to monitor student performance is the final exam.	Final exam attendance and mark
Female (History)	In many ways it was actually quite difficult to identify when students were struggling in a course. Often they would get in touch with me. They’d ask for an appointment or their log-in activity.	Contact initiated by student; Login frequency and duration

Our prototype student early alert system uses the engagement trigger to identify and take action (an intervention). Teachers were asked what information they would like to include in their alert other than information possibly from iLearn.

**Table 5.7: Sample Quotes for Sub-Themes (1st Order) ‘Actions’ showing the Sub-Themes (2nd Order)**

Participant/Discipline	Quote	Sub-Themes (2 <sup>nd</sup> Order)
Female (Women Studies)	I'd probably like to know what the students think of being sent an email saying, you are potentially failing this unit, because I wouldn't want them to feel like they've been either targeted unfairly...the wording would have to be fairly neatly written that it wouldn't be seen as a negative in a way. It's more of a, we're concerned that you're not progressing in this unit. You've fallen behind in these ways. What can we do to try and assist you? That sort of...it's all in the tone and the way in which the alerts are written. The student survey might actually help us to work out well what do they actually want to know? I think that's going to be crucial before creating some of these alerts and I'm sure that you've got some guidelines on that.	Alert content Alert medium Recipient

The three main themes identified from a preliminary analysis of the teacher interviews are ‘student early alert system’ that uses ‘engagement trigger/s’ to identify and take ‘action/s’ as shown in Figure 5.12 with their sub-themes.



**Figure 5.12: The thematic map. Ellipses show the main themes, rectangular boxes show the 1st order sub-themes and rounded rectangular boxes show the 2nd order sub-themes**

The first main theme, student early alert system has motivation to use, frequency of usage, when to use student early alert system, system features and concerns/challenges. The second main theme is the engagement triggers used by the instructor (via student early alert system) to identify and take actions (third theme) to aid students at-risk. This included class attendance, assessment submissions, assessment types, forum, logins, gradebook, final exam, access resources, and contact with the academic staff. The third main theme is the possible actions that an instructor takes to contact a student at-risk such as send an alert via an alert medium (e-mail or phone). It is noted that the alert content/intervention sent by unit convenors contained the engagement trigger/s. The map focuses on student early alert system and thus actions not involving student early alert system are not modelled. To keep the model simple and readable, for main themes ‘student early alert system’ and ‘engagement triggers’, 2nd-order sub-themes are excluded from the figure. See more about 2nd-order sub-themes in Table 5.3 column 4 presented earlier. The arrows/lines linking the main themes and 1st-order sub-themes specify the relationships in the direction of the arrows. The thematic maps for the individual main themes with their 1st and 2nd order sub-themes are in Appendix I.

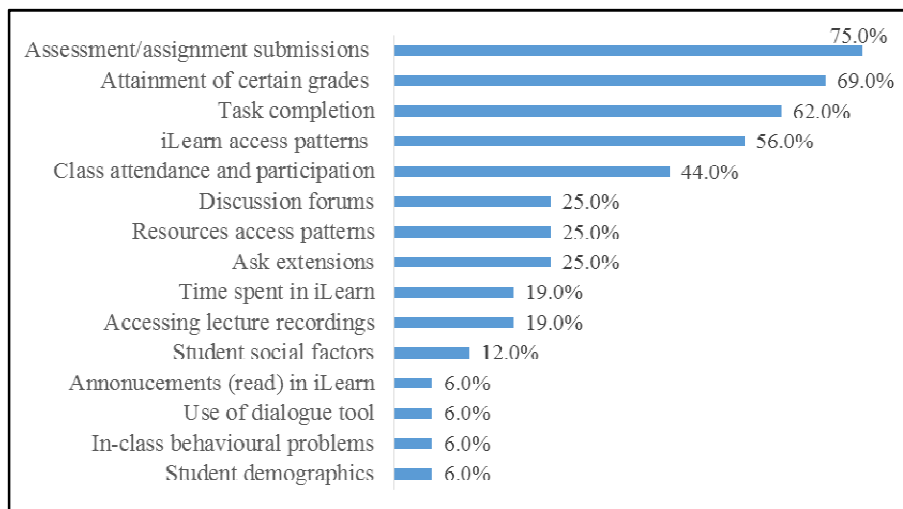
### **5.6.2 Quantitative Phase: Stage 1B**

The sample for this study included sixteen participants (unit convenors and student support staff) who used the extended prototype for all built-in indicators, i.e. login, forum, assessment, and gradebook to contact the students. The participants were recruited from all four faculties at our institution, Arts (2), Humanities (1), Business and Economics (8) and Science and Engineering (5). Frequency counts are used to describe the survey interviewee’s demographics (Table 5.8).

**Table 5.8: Summary of respondents' demographics**

Gender	Position	Current Role	LMS proficiency
Male 10 (62.5%) Female 6 (37.5%)	Professor 1 (6.3%) Associate Professor 2 (12.5%) Senior Lecturer 3 (18.8%) Lecturer 5 (31.3%) Adjunct Lecturer 2 (12.5%) Fellow 1 (6.3%) Teaching assistant 1 (6.3%) Support Staff 1 (6.3%)	Unit Convenors 14 (87.6%) Teaching Staff 1 (6.3%) Support Staff 1 (6.3%)	Novice 1 (6.3%) Intermediate 1 (6.3%) Advanced 12 (75%) Expert 2 (12.5%)

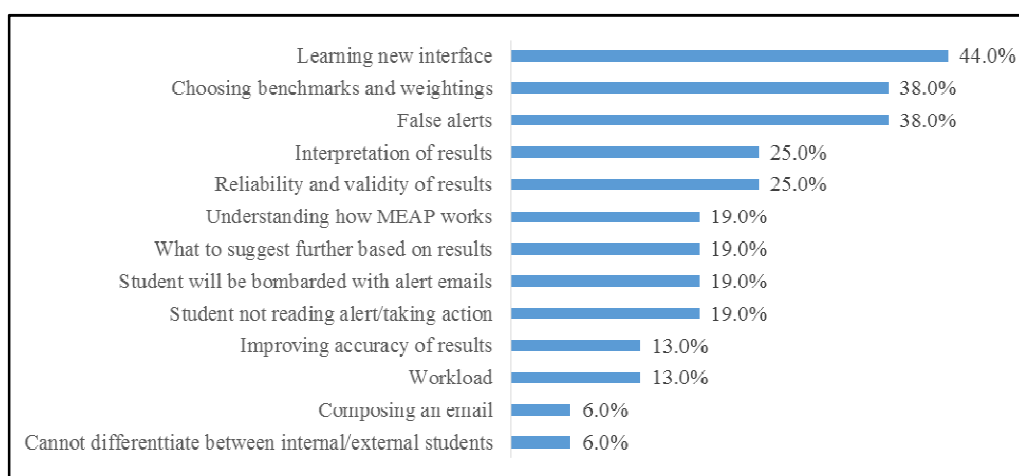
We specifically asked ‘For the unit/s you are managing, in terms of identifying at-risk students which indicators did you consider?’ We noted that the majority of the teaching staff consider assessment/assignment submissions (e.g. late, missing, incomplete or repeated attempts) (75%), attainment of certain grades (69%), task completion (62%), iLearn access patterns (56%), and class attendance and participation (44%) as indicators for identifying at-risk students. One teaching staff selected other and said that they will consider special considerations and any student that attempted the unit previously (Figure 5.13).

**Figure 5.13: Expectations and/or engagement triggers/indicators to identify at-risk students**

When the participants were asked how they used the prototype student early alert system, eleven respondents used the system for contacting students to send customisable and personalisable intervention emails, 2 used the system only for viewing/monitoring purposes and did not send any intervention emails while 3 did not use the system at all. Reasons for not using the student early alert system included being busy and not having time to use it (N=2) and that the prototype

system was down when they tried to access it (N=1). All respondents found the student early alert system useful as it enabled large scale analysis of individual student data. They commented that with a student early alert system they were able to identify and contact groups of similarly performing students and make personalised contact (including use of the student's name and mention of specific behaviours) through drafting of a single email to that group. While teachers mentioned that using student early alert system added a few extra hours to their workload, they felt that the time was justified because they would not be able to monitor and engage with their large classes without such an aid.

It is interesting to note that the majority (44%) of the respondents said that learning a new interface was a challenge to them (Figure 5.14). The respondents who selected other said that there were discrepancies between the student early alert system data from the LMS and the student information system data. This was because student early alert system was a prototype so it was accessible only on campus and data was periodically updated (twice a week) so real time data from LMS was not available all the time. Sometimes the available data was 4 days old.



**Figure 5.14: Challenges faced using the prototype system**

Respondents were then asked when was the prototype system of most use to them. The frequency of replies was in the following order: before census date (75%), start of the semester (week 3-5) (44%), when the assessment tasks are due (31%), throughout the semester (31%), mid semester break (25%), before Exclusion date (13%), and at the end of the semester (13%). More than half of the respondents (10, 63%) said that the alerts mostly sent by them were of an academic nature such as missed classes, non-submission of assessment/s, poor performance on assessments

or assignments and at-risk of failing the unit. Only 6 respondents (38%) said that they sent a combination of both academic and non-academic alerts (such as messages about well-being or financial issues).

Table 5.9 shows the actions/support suggested by the unit convenor or the student support staff as part of the early alert intervention. When the academic and support staff were asked whether they inform their students by other means that an early alert for them has been submitted, 9 (56%) said that yes they do inform via announcements in the LMS, face-to-face in lecturers, and tutorials and 7 (44%) said they did not.

**Table 5.9: Actions/support suggested by teaching and support staff as part of the early intervention**

<b>Actions/support suggested by teaching and support staff</b>	<b>N</b>	<b>%</b>
Withdraw from the unit	13	81%
Offer of consultation for in-person with at-risk students	12	75%
Attend tutorial, mixed class, workshop or practical	11	69%
Referrals to specific resources or services designed to assist at-risk students	9	56%
Complete missing/late work	9	56%
Suggest consulting other teaching staff	8	50%
Attend lecture(s)	8	50%
Listen to online lectures	6	38%
Acknowledgement of positive progress	5	31%
Get external coaching	1	6%

In another question, 11 respondents mentioned that the early alert from them prompted student action (such as students returning to class or contacting them). The unit convenors also mentioned that they observed an increase in login and class participation activity. Eight out of eleven participants said that the students acknowledged their lack of engagement and performance, were thankful for being contacted, intended to start working, and asked questions about how to get further support. Participants provided many useful insights on how the system could be improved such as to put the prototype on the live server, concurrency of data with other university systems, to send the alert to multiple email addresses and to add more graphical and visual information. Thirteen respondents (81%) said that they wanted to use the prototype system in the future, 2 respondents (13%) were not sure, and one said no. Only two participants (tutor and support staff member) said that they needed to provide a report for the head of the department and/or associate dean for learning and teaching with data on the numbers of identified and contacted

students, types of contact made, and reason for contact. The remaining 14 did not have any student early alert system -related reporting requirements. At the end of the interview, teachers and student support staff were asked a question including statements about the evaluation of the prototype around the ease of use, complexity, social factors, and behavioural intention to use the system, facilitating conditions, attitude towards using the system, effort expectancy and anxiety. These are not analysed because they are not related to the research questions but will be reported within the university to further refine the MEAP+ within the organisation.

## **5.7 Triangulation between the Teacher Perspective Data Sources**

The three sources of data (mentioned in section 3.2.5 i.e. interview, survey and literature review) all confirm that the role of a student early alert system is to improve student engagement and academic success. The literature identifies that there are demographic, personal, social or institutional factors from the external environment which have strong associations with student on-time graduation (Atif, Richards & Bilgin 2013; Frazelle & Nagel 2015). The questionnaires and the interviews provided more insight into this. Both confirmed that understanding students' and teachers' perceptions of the early alert process is useful to the higher education sector by contributing towards understanding the triggers and developing useful strategies to identify students at-risk, understanding why they are at-risk, designing interventions accordingly to reduce that risk, and finally closing the loop by tracking the effectiveness of the applied intervention(s) to improve student success and retention.

## **5.8 Discussion of the Teachers' Perspective**

This mixed methods sequential exploratory study aimed to gain a better understanding of the perceptions of teachers with respect to early alerts, the potential benefits of and barriers to early alert system usage. The aim of the reported study was not to provide an evaluation of a specific student early alert system, but to gather teacher perspectives based on actual experience, not perceived or envisaged advantages and disadvantages. Our data collection was situated within an institution and within the context of a prototype student early alert system in

actual use to provide alerts to students during one or more semesters of study. As mentioned in the literature review, many of the current applications of learning analytic tools in higher education institutions take a big-data view. In our context of unit-level student interventions, it seeks to collate data across the institution to inform students and departments or faculty when students are at risk and/or suggest opportunities (intervention) for improving their future performance to change their study behaviour.

The significance of student early alert system is that feedback and support could be offered to at-risk students while they are participating in a unit and have opportunity to modify their behaviour, rather than after they have failed one or more units. The triggers identified in our study are consistent with expectations/indicators used by teachers to identify students at-risk reported in the literature (Falakmasir & Habibi 2010; Macfadyen & Dawson 2010; Minaei-Bidgoli et al. 2003; Smith, Lange & Huston 2012; West et al. 2016). However, rather than manual identification, a student early alert system is able to identify at risk students automatically by utilising routinely captured or generated data by the LMS such as LMS access patterns, time spent in LMS, discussion forum post read/generated, class attendance, assessment and task submissions and attainment of certain grades. Because much of this data was already provided by our institutional LMS, it may seem that a student early alert system does not really add anything. However, this valuable data is time-consuming to access and evaluate. The raw data does not make the connection between student performance and behaviour with whether they were at risk. For small classes the raw data could be used by teachers to understand their students and how the cohort in general were going. For small classes where teachers are in close contact, teachers are likely to know their students and be aware of issues without use of the LMS statistical data. On the other hand, for medium and large classes, this is not possible, so teachers need support to help them identify, interpret and act based on the LMS data. Our study sought to identify whether a student early alert system could in fact help teachers with large classes to identify and assist students at risk, or would it be too hard to use or require too much time and effort.

The participants (mostly unit conveners) were motivated to use the prototype system to understand their students, to identify students' level of engagement and to identify their online activity. One unit convenor mentioned that the use of the

prototype will help in her other administration position as a program director to address responsibilities such as addressing high failure rates, falling enrolments and FYFS retention. A few other convenors mentioned that they will use the prototype for the validation of their unit design and as a duty of care as they want to change their students' attitude and behaviour to academic success. The majority of participants in our study found the prototype system useful (and helpful) in the identification of at-risk students and said that it did not add much to their workload. The few extra hours required to contact students at key points in the semester, such as census date, start of the semester, and when assessment tasks are due were considered good time investments for providing timely feedback and support. When teachers take the time to contact students pro-actively in the first few weeks or at particular points in the semester, the students feel connected to the teaching staff and the unit and they try harder to be successful in the unit (Campbell 2007; Gasevis, Dawson & Siemens 2015; Maher & Macallister 2013). Research has shown that a teacher's initial personalised contact (email or phone call) early in the semester can ease student fears going forward into the unit/course and helps the student to understand that their teachers are there for help and they care about their performance (Achilles et al. 2011).

Respondents expressed that the challenges and difficulties they encountered with the use of the prototype system included learning a new interface, false alerts and choosing benchmarks and weightings (Figure 5.14). This first difficulty (learning a new interface) is not surprising, since research (Aldunate & Nussbaum 2013; Price & Kirkwood 2014) has also shown that in some cases, teachers feel the use of technology or learning a new interface may become a challenge. This can be traced to either a lack of confidence or lack of computer usage skills (Bailey et al. 2004). The second challenge concerned choosing the benchmarks and weightings. Research suggests to set the thresholds for indicators using local (LMS) data wherever possible and to re-examine the accuracy of the indicators and thresholds every semester the unit is offered, since thresholds are likely to change. For example, if for a unit the teacher achieves positive results from targeting attendance, over time the teacher will most likely need to set higher expectations for student attendance. The realistic thresholds flag a significant number of students who can be helped through interventions (Koenig & Hauser 2011). While catching all of the

at-risk students and being able to deal with large numbers via a single email is an attractive feature of our prototype student early alert system, unit convenors were very concerned about misidentifying students particularly since the prototype contained data that was up to 4 days old and there was no synchronisation between the LMS data and the student support system that tracks special consideration requests. This concern was not a surprise because we knew that the LMS was running on a parallel test server rather than a live server and the prototype was under development stages. It is also mentioned as a technical limitation in chapter 8. The key strategy used by unit convenors was to experiment with their historical data in the unit to see whether changing thresholds made sense in their context and to look at detailed data for selected students, such as number of classes attended, last login, to confirm that the 'at-risk' scores made sense. As MEAP+ has gone live in 2017, the concern over stale data is reduced but unit convenors still rely on timely entry of marks and attendance records and having to manually reconcile which individuals have special permissions such as assignment extensions.

As unit convenors become more familiar with the MEAP+ interface and what triggers and thresholds work best for their units, these barriers to use are expected to decline. Possible improvements to the MEAP+ interface and perhaps the use of machine learning to predict/suggest thresholds, could reduce the learning curve for new users.

## **5.9 Summary**

This chapter presented the results of the perspectives of teachers (1) regarding early alerts and (2) the potential benefits and challenges of a prototype student early alert system using institutional learning management system data to improve the engagement and academic success of students at a unit level. The research methodology used in this study was an exploratory sequential mixed methods in two stages, qualitative followed by quantitative. We performed thematic analysis on the qualitative interview data from nine teaching staff to gain an initial understanding of their perspective towards early alerts and student early alert system. A quantitative survey was then created from the themes to gather the perspectives of another sixteen teaching staff who utilised an extended version of

the prototype. Then, results from both phases were compared, integrated and interpreted.

The next chapter present the conceptual student engagement and academic success (SEAS) framework at the unit level. The aim of the framework is to contribute towards increasing understanding and providing technological support to manage the complex factors that affect student success at the unit level.

## **6 CHAPTER: CONCEPTUAL STUDENT ENGAGEMENT AND ACADEMIC SUCCESS (SEAS) FRAMEWORK**

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### **6.1 Introduction**

The research was undertaken in the form of two studies: ‘student perspective’ study and ‘teacher perspective’ study. Data was collected and analysed separately in both studies. The objective of this chapter is (respondent group) *triangulation* by comparing the results from both student perspective and teacher perspective studies and interpreting the results. This allowed us to answer the following research question (1.5.2):

*What are the key concepts and their relationship that comprise a conceptual Student Engagement and Academic Success (SEAS) framework including the student and teacher perspective?*

This research was heavily situated in survey and interview data, mainly as a consequence of its underpinnings (student and teacher perspectives to early alerts), but also because the area was unexplored.

### **6.2 The Discussion and Comparison of Student-Teacher Perspectives**

Student early alert systems are becoming increasingly sophisticated technology and they involve alerts (pro-active contact) and intervention. However, there has been little attention directed at the significance of timing in determining the effectiveness of any intervention. This thesis includes research questions related to the timing of feedback/intervention (such as when and how students want to receive an alert) and the effects of positive and negative feedback (how students view their unit convenors after they have received an alert). The sooner an intervention can be arranged, the more time a student has to address the problem and/or get engaged with the unit content. A series of studies using absenteeism as an indicator of performance in the classroom have consistently pointed to the importance of providing feedback to the student early in the semester (Bevitt, Baldwin & Calvert 2010).

Concerning timing, in a comparison of student-teacher perspectives we found in the student perspective study that the majority of students from all units wanted to be contacted as soon as their performance is unsatisfactory (Figure 4.28). On the other hand, teachers preferred to restrict alerts to strategic time points (section 5.6.2), such as before HECS census date and/or when the assessment tasks are due. This difference is driven by concerns over teacher workloads. Interviewees (teachers) felt that though using a student early alert system added a few extra hours to their workload still they would not have time to be monitoring students continuously. Furthermore, interviewees expressed a concern that contacting the student too frequently would result in students ignoring alerts and noted that even getting students to read the email in the first place was a hurdle to overcome.

In answer to what behaviours might trigger alerts, teacher and student viewpoints showed some overlap and some differences. We found that most teachers would like to use assessment submissions (e.g. late, missing, incomplete or repeated attempts), attainment of certain grades and iLearn access patterns as (dis)engagement triggers (Figure 5.4) and use the early alert system for contacting students to send customised and personalised intervention emails that convey what behaviour needs to change and strategies to improve and access support (Figure 5.11 and section 5.6.2); additionally, one teacher said that s/he wanted to consider special consideration and any student that attempted the unit previously. Similar to the teacher viewpoint, students wanted to be contacted for low assessment scores followed by missing work, frequent absences and lack of participation/effort (Figure 4.28).

In an evaluation of student-teacher perspectives we found that both intended to use email as the primary form of contact (Figure 4.28 and section 5.6.2). It came as a surprise to the teachers that students expressed a preference for receiving early alerts via email rather than face-to-face, phone call, or letter/post card (Figure 4.28) because students often do not read their emails or take action based upon them.

Some national studies show that students are often highly apprehensive about seeking help due to uncertainty about what assistance is available, whom to approach and issues around confidentiality (Jones 2016; Kinnear et al. 2008; Maher & Macallister 2013). In learning about students' attitudes towards receiving an

early alert/intervention, the respondents appreciated that there was someone watching out for them and they are grateful that somebody contacted them about their academic standing in a unit (Table 4.31). Moreover, the students' who actually received an intervention responded that they now feel better prepared to deal with their academic situation and they now feel more comfortable to seek academic assistance during the semester (Table 4.32). In agreement, the teacher interviews confirmed that they intended to provide information in their alert about where students could get help (Table 5.9). It has been found that once students are aware of the help available and know whom to approach, they become more confident to seek help. This is also supported by qualitative studies such as (Singell & Waddell 2010; Tinto 2012) that early intervention with students by the teaching staff (lecturer/tutor) and other campus personnel (advisor/student support officer) can improve students' likelihood to succeed. Teachers also agreed that the students acknowledged their lack of engagement and performance, were thankful for being contacted, intended to start working and asked questions about how to get further support (section 5.6.2).

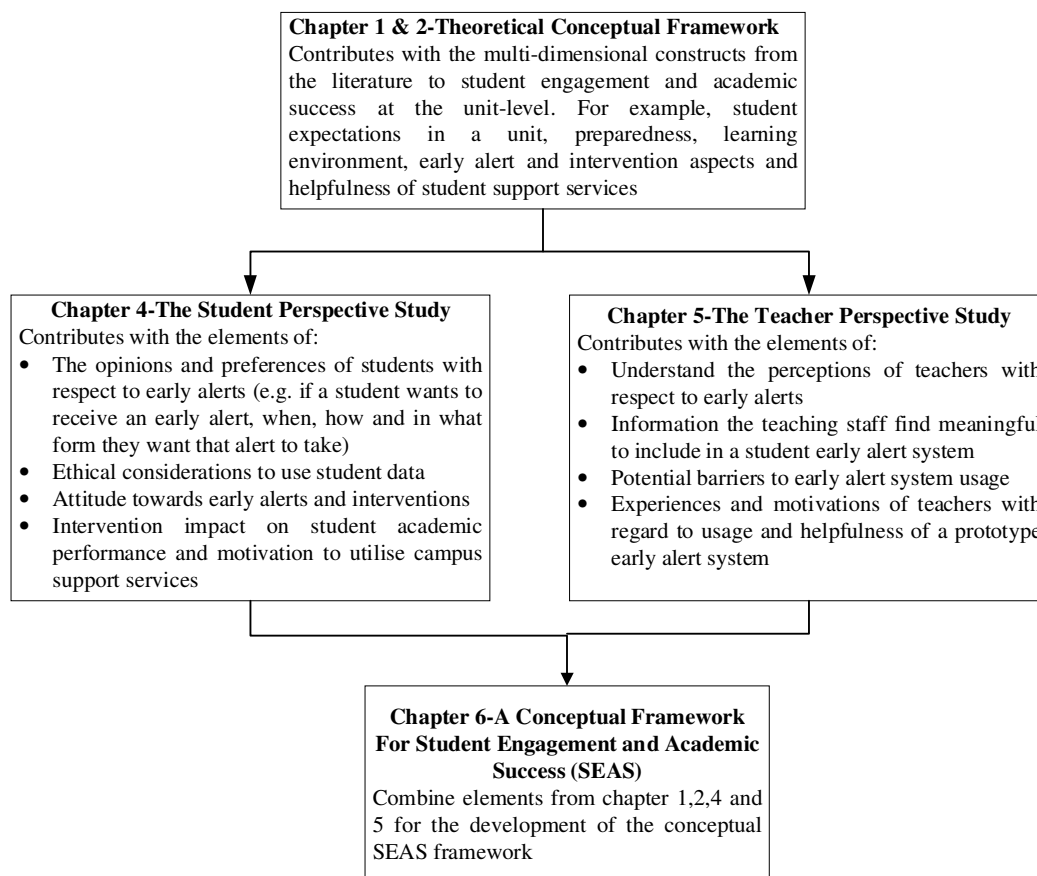
In general, an essential element in student academic engagement at the unit-level is the extent to which teaching staff are seen as approachable and supportive. Research studies show that there is often a mismatch between student-teacher perspectives on the intervention impacts regarding student levels of engagement (change in behaviours for how students' study or get engaged with the unit/course content) (Baron & Corbin 2012; Sheard, Carbone & Hurst 2010). Student learning and development have been shown to improve student academic success when students have opportunities to contact their teaching staff particularly, beyond class and when such contact is academic rather than administrative in nature (Kuh, Laird & Umbach 2004). This student-teacher perspective study showed that the early alert intervention impacts how the students viewed their unit convenor by making them feel like the unit convenor was supporting them to do well and was concerned about them (Table 4.43). The teachers mentioned that the early alert from them prompted student action such as an increase in login and class participation activity, students returning to class or contacting them (section 5.6.2).

All respondents (both students and teachers) found the student early alert system useful (and helpful) in the identification of at-risk students. Teachers are of the

viewpoint that it enabled large scale analysis of individual student data. They further commented that with student early alert system they were able to identify and contact groups of similarly performing students and make personalised contact (including use of the student's name and mention of specific behaviours) through drafting of a single email to that group. If contacting the student (intervention) requires additional effort on behalf of the teacher, it is understandable that many will simply choose not to use the system. This difference is driven by concerns over teacher workloads. Teachers mentioned that using student early alert system added a few extra hours to their workload. On the one hand, they were willing to spend those extra hours because they would not be able to monitor and engage with their large classes without such an aid. However, on the other hand, it was not always possible to find an extra hour or two to do a careful analysis and write thoughtfully worded emails. Often it is not a matter of the actual hours the task may take but the sense of burden of an additional monitoring task and keeping it in the back of your mind. Given the importance of timing, an issue is that often the optimal time for doing some analysis of the performance of the cohort and sending some alerts is also when teachers are very busy with day to day teaching and operational concerns. Given the need for alerts to be sent based on accurate data, provide useful and sensitively crafted explanation and support, there is pressure to make sure that teachers get it right. This is not something that can be rushed or squeezed into an already hectic day. It is much easier to find time to review student performance after the semester is over, but that is too late. This mismatch between when students need alerts and when teachers have sufficient time to conduct careful analysis and send sensitive alerts is a major hurdle.

### **6.3 Derivation of the Elements Included in the Conceptual Framework**

The core elements of the conceptual framework for the student engagement and academic success and their inter-relationships mainly comes from the theoretical framework (chapter 1 and 2), student perspective study (chapter 4) and teacher perspective study (chapter 5). Figure 6.1 shows the elements of the conceptual SEAS framework and their relationship to different chapters of the thesis.



**Figure 6.1: The elements of the conceptual SEAS framework and their derivation to different chapters of the thesis**

### 6.3.1 The Elements of the Conceptual Framework

The SEAS conceptual framework has three essential components: (1) the unit environment (2) learning analytics at the unit-level and (3) the drivers of student success. These components draw together the literature as presented in chapter 2 as well as extend and challenge existing theories based on the findings in this thesis. It is important to note that these components are discussed within the scope of the goals and study conducted (section 1.8) such as restricted to learning analytics and unit-level data.

#### 6.3.1.1 The Unit Environment

Students are nested within their external environments, which includes work, family, the community in which they are situated, the economic conditions present in those communities; higher education institution environment such as standards, achievement expectations; and the unit environment. In an online unit environment, student engagement and success is measured by the learning and teaching activities involving the teacher, student and the unit content. Figure 6.2 shows the interactions

by the Venn diagram. The interactions such as student-teacher, student-unit content and teacher-unit content (and vice versa) are recorded in the LMS and/or institution specific sources. These interactions form part of the 'big data' (other than demographics, enrolment or library data), higher education institutions are collecting, analysing and reporting to understand students' learning behaviours and student motivation to continue in the unit. It is important to understand the unit environment and the various interactions involved to identify the factors/drivers of student success that are connected with students' engagement and positive or negative experiences of learning.

### **6.3.1.2 Learning Analytics at the Unit-Level**

At the unit-level, the benefits of learning analytics are two-fold. Firstly, its job is to help students to get detailed information about their performance. Secondly, teachers can better monitor their students such as how they are doing. By having a learning analytic tool like MEAP+, teachers are able to monitor the level of engagement and likely success of their students. MEAP+ uses LMS data captured naturally as the student progresses through the semester and allows thresholds to be set using predefined triggers to identify the at-risk students. Additionally, when the tool makes it easy to contact students by name about their specific performance in the unit, the teacher and student are able to have personalised interaction. Learning analytics at the unit-level allows the teaching staff, particularly the unit convenor to get answers to questions such as: how often, how recently and/or how long are students logging in? are students reading, posting and/or replying on forums? are they submitting their assessed work and/or submitting on time? what unit resources are they using the most? are they at-risk of failing the unit? In particular, the above questions can be used as a checklist that provides guidance to teachers to send interventions to assist students in achieving academic success.

#### ***6.3.1.2.1 Ethics of Accessing and Using Student Data***

In the context of this research, the ethics of accessing and using student data refers to the use of information already collected by Macquarie University about individual students such as demographic data, admission and enrolment data, data from iLearn, library and student services. Ethics and privacy issues have been important considerations in recent years at the international level with most

discussion around the need for development of institutional policy and guidelines. Some noteworthy examples are: the DELICATE checklist to implement trusted learning analytics developed by the European LACE (Learning Analytics Community Exchange) project (Drachsler & Greller 2016) and JISC (Joint Information Systems Committee) Code of Practice for Learning Analytics in the UK (Sclater & Bailey 2015). At the national level, there are two OLT (Office of Learning and Teaching) funded projects which have included ethical considerations (Colvin et al. 2015). As per my knowledge, there is more work-in-progress of developing policy or guidelines for ethical principles for learning analytics at the institution level such as development of Code of Practice at Charles Sturt University, Australia (Welsh & McKinney 2015). Macquarie University is also in the process of finalising policies regarding the use of student data for learning analytics (Learning for the Future-Strategic Framework 2015-2024 available at [https://www.mq.edu.au/\\_\\_data/assets/pdf\\_file/0010/45838/185603.pdf](https://www.mq.edu.au/__data/assets/pdf_file/0010/45838/185603.pdf)).

Policies for enforcing student's rights to privacy and ensuring restricted and approved access to student data are important. Hand in hand with these policies, we need to understand what students think about use of their data, even in contexts where teachers and the institution believe that access is in the students' best interest. If students don't want help and/or don't want to be told when they might need help, then should they be subject to such interventions? In this research, students were asked for permission to access their demographic and academic background to support their learning and/or for their data in iLearn, or other academic data held by university, to be used to identify and send early alerts about their performance (section 4.8.3.2.6). The results reported in this thesis shed much needed light on the ethics of accessing student data from the student perspective; revealing that not only are most students willing to give access to their data for this purpose, they also expect teachers and the institution to do so.

#### **6.3.1.3 The Drivers of Student Success at Unit-Level**

Much of the research to-date has focused on increasing student success and retention at the institutional level such as overall grade point average (GPA) or graduation rates. In order to move toward a unit-level engagement and academic success, the conceptual SEAS framework (Figure 6.2) challenges some factors of the 'old theories/models' which describe student engagement based on cognitive,

social and institutional aspects and tend to pay little attention to success factors at the unit/subject level. While these are not disputed as being relevant to the ultimate success and retention of a student, as stressed earlier, students succeed or fail firstly at the unit level. The EFA analysis in chapter 4 section (4.3.4) helped to identify the drivers of student success at the unit-level for this SEAS model. The drivers of student success were related to the multi-dimensional constructs cognitive aspects, unit-specific aspects, early alert and intervention aspects and learning environment and institutional aspects of our theoretical framework (Figure 4.1).

The high-level definitions of the drivers of student success are presented next.

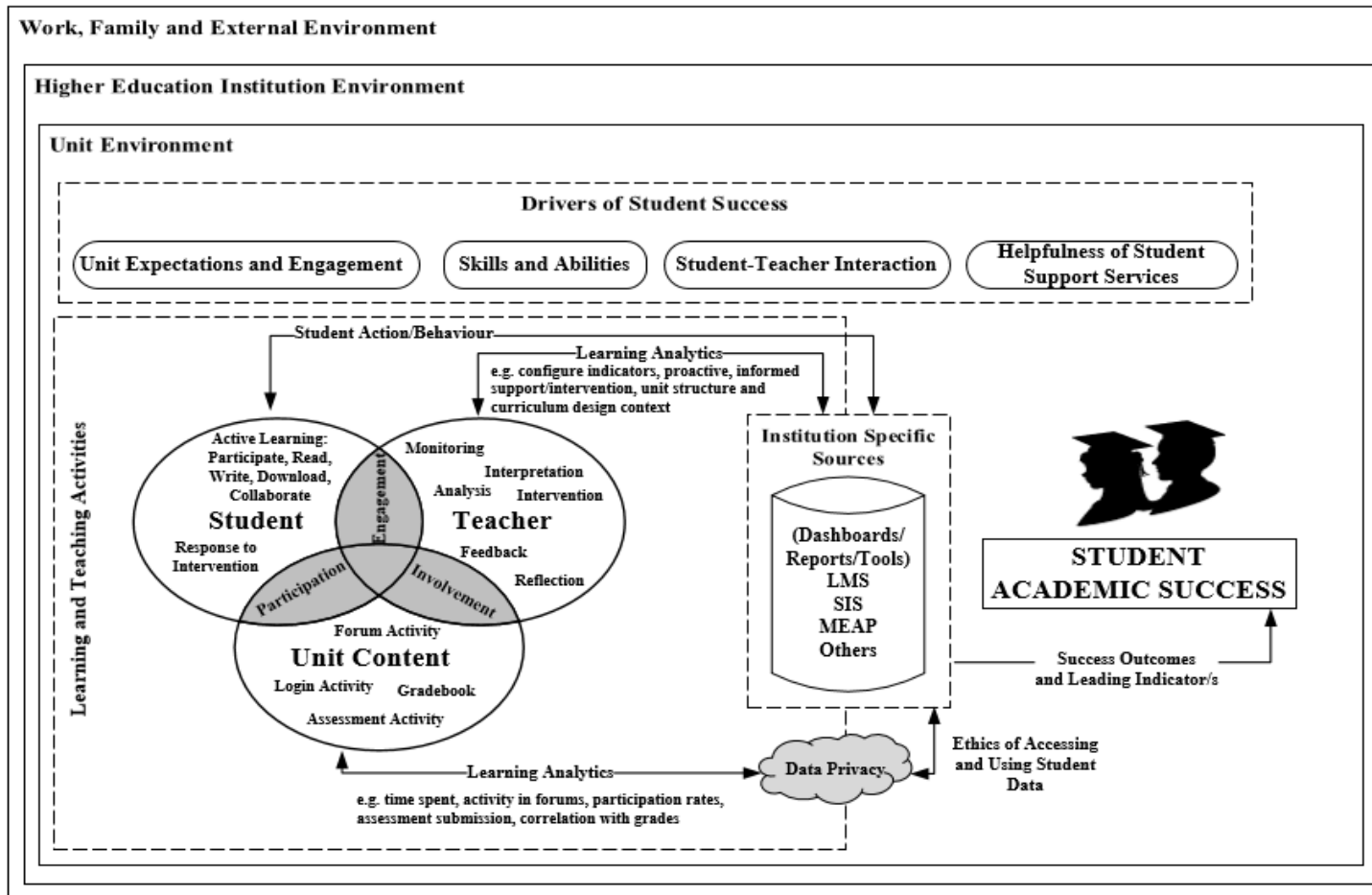


Figure 6.2: Proposed student engagement and academic success (SEAS) framework (within a single unit)

#### **6.3.1.3.1 Understand Expectations and Engagement**

Teachers seek to assist students to succeed by careful lesson planning and preparation of content and assessment tasks. In general, a unit's content contains the concepts, knowledge and skills students need to learn based on the curriculum. Depending upon the unit design, unit content may include various delivery formats, for example, readings, lecture recording or video, online activities such as discussion forums, quizzes or assignment submissions. Unit websites are usually structured to assist students to structure their learning over the semester. Weekly readings and material are likely to be separated by week. Teachers expect students to utilise these resources and respond through participation, engagement and learning.

A student's performance in a unit is usually driven by the expectations that teachers have from their students; that students have from their academic staff; and the unit learning environment. Typically, the unit expectations (set by the teaching staff) are communicated to students through unit guides including course contents, assessment tasks, grading standards, resources such as textbooks and unit LMS page e.g. announcements. Students could understand what is expected of them in the unit and adjust their behaviours accordingly. In the earlier case studies, to understand the student expectations of the unit and the teaching staff, questions were included in the *Initial* and the *Follow-up* surveys. Regarding the unit, students were asked on a scale of 1 (strongly disagree) – 5 (strongly agree) whether the unit was [expected to be] easy, minimal course work and to be contacted regularly by the teachers. Regarding the expectations from the teaching staff in the unit, students were asked on a scale of 1 (strongly disagree) – 5 (strongly agree) about the [expected] quality of teaching, whether the teaching staff are approachable, teaching staff availability to discuss their work and give helpful feedback. From the results of chapter 4, it is concluded that students value teacher-student interactions for learning and support. Moreover, a timely contact from the teacher does change the way a student studied for a unit which results in more engagement such as doing the readings and/or completing their missing assignments or quizzes.

In an online LMS environment, student engagement can be measured through their online behaviour such as login to the unit page; participation in online unit related activities (such as weekly quiz); tutorial attendance and participation; submitting

weekly tasks; reading and downloading unit resources. In the theoretical framework (chapter 1), we attempted to extend the concept of student engagement (to cognitive and emotional) at a unit-level to explore student's expectations and motivations which result in their change of behaviour to study in a unit (Appendix E). The final study results in chapter 4 also showed that students felt that a caring, positive and supportive learning environment helped them to get more engaged with the unit and they know (and feel confident) where to seek help from.

In a traditional face-to-face learning system that was mainly a teacher-centric style, students interact with teachers directly by face-to-face interaction. Distance education and online learning environments (use of LMS) caused a big shift in learning decentralisation and resulted in more online learners (Ke & Kwak 2013; Kyung & Im 2013; Sargeant et al. 2006; Simpson & Armatas 2003). This results in multiple interactions among students, teaching staff, unit content and the LMS interface. One of the essential drivers to gauge student success in an LMS is student interaction (Agudo-Peregrina et al. 2014, p. 542). It could be student's interaction with the teaching staff (unit convenor and tutors), interaction with the unit content and interaction with other students. *Student-teacher interaction* is very important to encourage students' interest to the unit contents and stimulate their motivation to learn. Teachers can have a considerable contribution towards students' understanding of unit concepts and provide feedback or intervene when they are at-risk. *Student-unit content interaction* is the process of interacting with the unit content that results in changes in the student's understanding or the student's knowledge. *Student-student interaction* is the last type of interaction that happens among students individually or in a group that may focus on building knowledge and developing specific skills.

The Venn diagram in the SEAS conceptual framework (Figure 6.2) depicts unit engagement and the various student interactions.

#### **6.3.1.3.2 Skills and Abilities**

There are various types of skills and abilities that a student brings in the HEI environment. One is the intelligence/competence, knowledge (declarative or procedural) and academic ability and the other is the so called 'generic' or 'graduate' skills and abilities which a student gains incrementally as they progress

through their units and other life experiences. Students will also bring varying degrees of discipline-specific knowledge based on their school education and previous units. This knowledge is often called pre-requisite knowledge and formally identified and enforced through progression paths of units with prerequisite units that must be taken first. For the SEAS conceptual framework, we include both cognitive ability and generic skills. Depending on the level of study (e.g. first year) prior discipline knowledge may or may not be required, and also falls under this factor. The main study in this research also shows that among other factors, lack of academic preparedness or specific study skills was the main factor students thought might affect their academic performance. Eventually, both (discipline) unit-specific knowledge and generic skills learned in the unit such as group work etc. along with personal attributes can help student in their work placement. On one hand, it is important that students have a realistic picture of what university study or the chosen degree/program will involve. If they take the unit with the pre-requisite academic skills and knowledge and the capacity to learn and study, they can succeed. On the other hand, particularly with first-year first-semester students may have little or no idea of their prerequisite knowledge and/or how they are performing in comparison with other students. Often, HEIs have support services tailored to their student needs. For example, Macquarie University offer student services, such as numeracy centre, learning skills program and face-to-face consultations (e.g. HELP101). Being a casual tutor in my department, we have observed that unfortunately these services often go underused by students who could actually benefit from them the most. An important application of the SEAS conceptual framework by using a learning analytics tool such as MEAP+ is to help students by providing them with the required information on how they are progressing and what they need to do to meet their educational goals.

#### ***6.3.1.3.3 Student-Teacher Interaction/Support***

The theoretical framework in this research relied on Tinto's theory of departure and Astin's theory of involvement (I-E-O model) work which identify factors as positive interactions with the environment and increased teacher-student interactions to achieve more participation and engagement with their studies. It is important to note that the focus of this research is the increase in student engagement due to student-teacher interactions within the unit environment. The

focus is not to increase the student engagement outside the unit boundaries that is on the campus such as clubs, job fairs or other social events. In this research as shown by the SEAS framework, the student-teacher interaction or support is increased through the use of MEAP+ (email sent to at-risk students). Part of this teacher support is to provide students feedback about their performance and also to point students to help they may be able to receive from the institution such as disability service, financial aid services and learning skills program. The literature supports that during the first year of study, getting timely feedback and/or intervention has high impact as students are trying to adjust their behaviours to the new academic and social demands of university life (Poulos & Mahony 2008; Robinson, Pope & Holyoak 2013). The decision tree results from chapter 4 final study indicate that if a student receives an email from the unit teaching staff indicating their low performance, it is more likely that student will directly contact the teaching staff (Figure 4.21 and Figure 4.22) and felt better and/or felt improved. These communications develop the student's academic engagement, possibly resulting in better unit retention rates.

#### ***6.3.1.3.4 Helpfulness of Student Support Services***

Usefulness of student support services was identified as a critical factor in the literature review and we included it in our theoretical framework to investigate the accessibility to campus support services and effectiveness of the intervention/s to include the timely referral of support to at-risk students (Table 2.2). We discussed in chapter 2 (section 2.2.4) that usually first year students may feel difficulties with feeling anxious, loneliness and their general well-being which can have a negative impact on their academic performance. Helpfulness of the support services was identified as a factor for student academic success at the unit-level (chapter 4, section 4.8.3.7.4). The results for questions related to student support services were consistent with the research (Kuh 2008; Pietras 2010; Schwebel et al. 2008; Teasley & Buchanan 2013) that students believe that support services were available to help, the hours of operation for the support services were convenient and they provided them with the accurate information (Table 4.44 and Table 4.45).

## 6.4 Conceptual Student Engagement and Academic Success Framework (SEAS)

The aim of this research was to understand the student and teacher perspectives across our institution regarding the use of early alerts. Furthermore, this research aimed to share the understanding gained in our institution with other researchers, teachers and institutions in a manner that others can utilise within their own context through creation of a conceptual SEAS framework.

The SEAS framework (Figure 6.2) includes the *external environment* outside the higher education institution environment such as *work or home environment*. The literature identifies that there are student demographic, personal, social or institutional factors from the external environment which have strong associations with student on-time graduation (Atif, Richards & Bilgin 2013; Frazelle & Nagel 2015). Examples of such factors may be family social status, parental formal education, finances, hours of employment, family responsibilities, religious background, cultural values, family and peer influence.

The *higher education institution environment* is undoubtedly a place where students come to change their lives and may result in the biggest social change they have ever experienced. Theoretically, HEI is responsible to provide appropriate support to students during the education years, both academically and socially. Tinto's (1975) research shows that some psychological factors are related to almost all students at some level such as stresses of first year and lack of confidence, anxiety and pressure in minority and low-income students.

Student success is complex. We believe that solutions need to be multipronged and holistic. However, a common way to solve complex problems is to break them down. Taking the perspective that students fail or succeed at the unit level, unit by unit, and given that our LMS data is at the individual unit level rather than the institutional level. The factors at the unit level are elaborated in this SEAS framework. This narrowing of focus does not deny the importance of the higher education institution and external environments and their significant influence on the student and their success, but reflects our inability to monitor or modify these factors in the context of our current SEAS.

Nested with the external and HEI environment, is the *unit environment*. Unit environment is the actual learning environment where a student's intellectual development takes place as a result of various *learning and teaching activities*. According to Pascarella and Terenzini (1983, p. 57) the [unit] learning environment is described as “an active force that not only affords opportunities for change-inducing encounters but can also, on occasion, require a student to respond [to change]”. The unit learning environment and related variables could have a dramatic effect on student achievement and academic success.

Within a unit environment, student success is driven by *understanding the unit requirements, skills and abilities* related to unit preparedness, *unit expectations, unit engagement*, and *student-teacher interaction/support*. These drivers of student success were described in detail in section 6.3.1.3.

Student *engagement* in a particular unit is viewed as a potentially overlapping activity with the *student, teacher and unit content* (shown by the Venn diagram in Figure 6.2). The learning analytics process starts with the data-gathering step. In this step, data is collected from different *students' activities* such as active learning data, participation in unit related activities, collaborative exercises, downloading lecture resources, writing a forum post or reading a document and response to intervention. The *teacher* activity includes the teacher's *expectations and/or (dis)engagement indicators/triggers* considered by unit convenors to identify at-risk students (Figure 5.8) and *support/interventions* suggested by the teaching and support staff (Table 5.9) for improving students performance within a unit. The *unit content* includes the indicators the teachers can use in MEAP+ including whether students are: late in submitting assessments or quizzes (*Assessment Activity*), infrequent logins onto iLearn (*Login Activity*), not obtaining sufficient marks in their tasks (*Gradebook*), and not participating in forums (*Forum Activity*). The teacher can *configure these indicators* in MEAP+. Then (*learning*) *analytics* tracks which students deemed at risk of falling behind. MEAP+ allows teachers to contact students via their university email in an efficient manner, using the power of learning analytics to focus on students that may need the most help. This is in line with our results from the quantitative phase (Stage 1B) as the teachers used the prototype system for *contacting/intervene/providing feedback* students at-risk, *analysing, viewing/monitoring, interpreting results* purposes. All *learning and*

*teaching related activities* are stored in *institution specific sources* (dashboards, reports/tools) such as learning management systems (LMS), student information system (SIS), student early alert system (MEAP+), and/or other systems.

This action leads to *students' academic success* and as a result more students persist in the unit and eventually academically succeed. *Success outcomes and leading indicator/s* such as mid-semester grades or grade point averages could be fed to institution specific sources to make the process more robust. However, the purpose of learning analytics (using MEAP+) is to be able to manage many students. It provides tailored feedback and alerts, and thus provide a more personalised learning experience (Smith, Lange & Huston 2012). This kind of personalisation will likely lead to greater success in the unit/course.

## **6.5 Summary**

This aim of this chapter was to triangulate the results from the student perspective study (chapter 4) and teacher perspective study (chapter 5) to identify the key concepts and relationships to develop a conceptual student engagement and success framework (SEAS) at a unit-level. However, we did not ignore the influence of the factors from the external environments such as work, family, social and/or the HEI environment. The resultant conceptual SEAS framework was discussed from three dimensions (section 6.3). First, the interaction of student-teacher-unit content within the unit environment. Second, how learning analytics can be used by the teachers to identify less engaged students and support them by timely interventions. Third, the success factors at the unit-level. The resultant conceptual SEAS framework expected to understand the further investigate the various factors that can impact student success at the unit-level.

The next chapter will provide an enactment of the MEAP+ system at our institution and its recognition through quotes from teachers and students and the receipt of institutional awards.

## 7 CHAPTER: MOODLE ENGAGEMENT ANALYTICS PLUGIN (MEAP+) NOW

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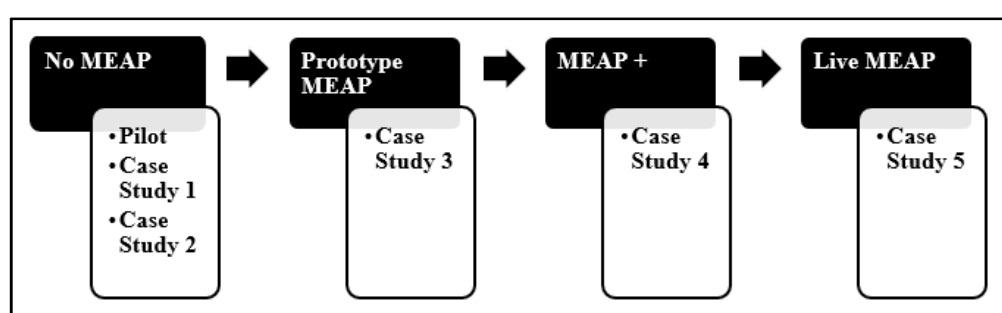
### 7.1 Introduction

This chapter presents the ratification of the MEAP+ system at our institution. MEAP+ went from a tool only available to a small group of unit convenors on a test server to all unit convenors on the institutional LMS. Section 7.2 describes the impact of MEAP+ at our organisation. Section 7.3 describes MEAP+ now and confirms its recognised value through quotes from teachers and students and receipt of institutional awards.

As a follow-up and confirmatory study, Section 7.4 presents an additional case study conducted post implementation of university-wide rollout of MEAP+ to capture the *qualitative* student perspective data. As presented in chapter 4, the student perspective quantitative study laid a solid foundation to confirm students' opinions and preferences with respect to early alerts through the capture of quantitative data across our institution over multiple time period. At that early stage, rather than conduct focus groups or interviews that would only represent a small number of students, taking a quantitative approach sought greater representation. The literature as presented in chapter 2 was used as the basis for the questions used in the quantitative survey. Because a body of literature existed concerning student success, it was not deemed necessary to discover success factors from in depth interviews from specific groups of students. Through accessing larger numbers of responses and opinions that included students at risk/not at risk and students who had and had not received alerts, we were better able to make comparisons and draw conclusions. Since the surveys and early alerts were likely to involve a predominance of first year students, because we were targeting large classes and failure rates that tend to be highest in first year courses, we chose to start with a quantitative approach that provided suggested answers to questions for students to choose from. We believed such an instrument would be easier for newer less mature students to respond to. We acknowledge that qualitative and open-ended questions can allow greater exploration and insights, particularly where there is sparse literature, and allow researchers to not only answer what or how, but also to ask why. For this reason, in this chapter we seek to further validate our findings from

Chapter 4 through the capture of qualitative data where the questions asked in Chapter 4 have been utilised but the responses are open-ended rather than restricted. We seek to confirm that important options and concepts were not overlooked previously and also to confirm that our quantitative and qualitative results are consistent.

The five case studies helped us unpack and understand the challenges associated with students' attitudes and behaviour after receiving an early alert/intervention. Figure 7.1 shows the different ways students were contacted or received an intervention across all studies for their academic progress.



**Figure 7.1: Different ways Students were contacted or received an intervention across all studies**

Next, we present the impact of MEAP+ at our organisation.

## **7.2 Impact of MEAP+ on Developing Organisational Capacity at Macquarie University**

Before conducting the MEAP case studies (case study 3 and 4), there was little organisational capacity in learning analytics. After the respective case studies, we developed organisational capacity in learning analytics which allowed us to improve learning and teaching at Macquarie. The development of MEAP+ was only the first stage. Next was the integration of MEAP+ into practice. We have used existing frameworks by Arnold et al. (2014) and Beer et al. (2014) to embed learning analytics into the process and practice used for identifying at-risk students and providing interventions.

**Table 7.1: Summary of Organisational Capacity for Macquarie University**

<b>Summary: Organisational Capacity for Macquarie University</b>		
<b>Category</b>	<b>Evaluation Description</b>	<b>(Future) Actions Taken</b>
Technology infrastructure, analytics tools and applications	<ul style="list-style-type: none"> <li>- Development of MEAP within the existing LMS</li> <li>- Design-based research methodology (DBR) to understand the needs of unit convenors and student support staff around measuring student performance and how they would determine if students were engaged</li> <li>- Using up-to-date LMS data</li> </ul>	<ul style="list-style-type: none"> <li>- Iterative and incremental development of MEAP+ to display more meaningful information about student engagement with the LMS and provide for efficient and personalised communication with selected students</li> <li>- Due to the exploratory nature of the research, it was necessary to set up test servers with clones of the organisational LMS. Though resulted in obvious infrastructure issues in case study 3 and 4. It was improved when became available on iLearn, the enterprise system. It is important to note that the thesis was near to submission by the time and no further case studies were conducted. See next section for more details.</li> </ul>
Policies, processes, practices & workflows	<p>Policies, processes and practices around:</p> <ul style="list-style-type: none"> <li>- Governance</li> <li>- Data stewardship and usage</li> <li>- University-wide code of practice for learning analytics</li> <li>- Workflows</li> </ul> <p>This study uncovered expectations of student support at the unit level across the university which provided an opportunity to suggest standardised practices.</p>	<ul style="list-style-type: none"> <li>- Student support models:               <ol style="list-style-type: none"> <li>(1) Unit convenors being wholly responsible for student support, where they used MEAP+ to identify and contact students and follow up with support. This included composing and sending personalised messages to students with specific instructions and references to support materials.</li> <li>(2) Unit convenor/s worked with student support staff to identify students and compose messages. Students were also referred to additional support programs run by the faculty and support staff followed up with them. (units with large enrolments &gt; 450 students)</li> </ol> </li> <li>- Development of a workflow that include what type of unit MEAP+ was most effective for, strategic times during the semester to contact students, how to compose the most effective messages for students, aligning the use of at-risk</li> </ul>

		<p>indicators in MEAP+ with the instructional design of the unit, sharing information about at-risk students with support staff, and using MEAP+ as an evaluation tool to make unit improvements at the end of semester</p> <ul style="list-style-type: none"> <li>- ‘Do it for’ teachers’ pathway (Beer et al., 2014). Unit convenors who want to use MEAP+ must complete a training session and were supported by learning and teaching staff. They were provided with regular communications during the semester about approaches to using MEAP+ that include typical questions and issues. Unit convenors are also automatically enrolled in an online community of practice on learning analytics within the university</li> <li>- A flexible and iterative approach where practices and workflows were adapted and amended following lessons learnt and feedback from staff</li> </ul>
Values and skills	<ul style="list-style-type: none"> <li>- Training with MEAP+ to help and support the unit convenors and support staff</li> <li>- Evaluation of the impact of MEAP+ on student learning and unit convenor teaching experience</li> </ul>	<ul style="list-style-type: none"> <li>- Develop User Guide for MEAP+ and discussions around how to interpret MEAP with unit convenors (Appendix G)</li> <li>- Students’ expectations of early alert systems and their experience of personalised messages from MEAP+ were surveyed (Chapter 4)</li> <li>- ‘Do it with’ teachers’ pathway (Beer et al., 2014). It was important to develop an understanding of the experience of the unit convenor and students so as to establish how an early alert system could best support learning and teaching (Chapter 5)</li> </ul>
Culture and behaviour	<ul style="list-style-type: none"> <li>- Understanding student perspective</li> <li>- Understanding teacher perspective and barriers to usage</li> </ul>	<ul style="list-style-type: none"> <li>- Data for the student survey were collected over two years and each of the case studies helped us to identify and understand the challenges associated with students’ opinions and preferences with respect to early alerts</li> </ul>

		<ul style="list-style-type: none"> <li>- The teacher perspective study resulted in new experiences for unit convenors and students that led to reflection and change</li> <li>- Unit convenors having realised the impact of MEAP+ on supporting their teaching, resulted in a growing body of staff who relied on the tool to support students</li> </ul>
Leadership	- Senior management support	<ul style="list-style-type: none"> <li>- This PhD study is an exploratory first study in our institution. As mentioned in chapter 1, part of it was carried as a Teaching Development grant. The culture and behaviour that had been developed during the MEAP pilot acted as an impetus to drive senior management to support the integration of MEAP+ into teaching and learning at the university. In early 2017, MEAP+ went from a tool only available to a small group of unit convenors in a case study on a test server to all unit convenors on the institutional LMS</li> </ul>

Arnold et al. (2014) presented a framework to develop organisational capacity which is based on five stages: (1) technology infrastructure, analytics tools and applications; (2) policies, processes, practices and workflows; (3) values and skills; (4) culture and behaviour; and (5) leadership. They argue that ideally they should all be addressed if organisational capacity in LA is to be achieved (Arnold et al., 2014). We consider each of these stages in the context of this research (Froissard et al. 2017). Table 7.1 shows the summary of the organisational capacity for learning analytics at the Macquarie University.

### **7.3 MEAP+ Now**

As mentioned in chapter 1, research on innovation systems such as MEAP and policies on ethical use of student data for learning analytics is part of Macquarie University's future-strategic framework 2015-2024 (Learning for the Future-Strategic Framework 2015-2024 available at [https://www.mq.edu.au/\\_\\_data/assets/pdf\\_file/0010/45838/185603.pdf](https://www.mq.edu.au/__data/assets/pdf_file/0010/45838/185603.pdf)). With the understanding of both the student and teacher perspectives, cultural and organisational issues and barriers around the use of student data, early alerts and the development of MEAP+ have contributed to the future sustainability of our institution at both a technological and cultural level. Technological, as it provides a learning analytics case study that has involved all faculties and utilised existing university systems and processes. Cultural, because it contributes to attitudes, practices, skills and knowledge development of teachers, which as a result develops the current and future capability of the university to use learning analytics to improve teaching and learning.

MEAP+ is now available on iLearn, the enterprise system. MEAP+ is supported by Learning Technologies Services support unit and is integrated into the university's process for maintenance and support of learning technologies. Also, as MEAP+ is available on the enterprise system, it is scalable. This means that it can as easily support one convenor and their students as all convenors and their students at the university.

Macquarie University is in the process of implementing an integrated data and learning analytics approach to support student retention, progression and success. As part of a current project on 'Curriculum Review and Design', Macquarie is

looking at the integrated approaches to program evaluations that include student and peer feedback, reflections and learning analytics.

### **7.3.1 Student Learning, Engagement and Experience**

#### **7.3.1.1 Enhanced Convenor Capability to Better Support Students**

Prior to MEAP+, no functionality was available in iLearn to efficiently identify and contact students at scale. Unit convenors had to consult a number of reports in iLearn and then interpret what these inadequate reports said about their students. They had to spend considerable time selecting and contacting students outside iLearn. As a result, a small number of dedicated convenors infrequently and inconsistently identified at-risk students and contacted them. Most at-risk students were not being identified, contacted or offered support.

With the development of the MEAP+ in iLearn, the unit convenors were supported to enhance their support to student learning and teaching. By using the four indicators (assessment, login, forum and gradebook) in MEAP+ the unit convenors were able to create a profile for each enrolled student's online participation. This helped them to identify at-risk students and send them personalised emails. This has resulted in more 'convenor-to-student' contact and greater institutional capability to impact on student learning, engagement and experience in the online environment.

Following are a few quotes from unit convenors with their experience with MEAP+.

A Unit Convenor (Arts) said:

*Before MEAP+ came along, I would use the time-consuming method of going through individual iLearn logs to identify at-risk students in my unit to send them individual messages. MEAP+ provides a far more efficient way to identify students by level of engagement and achievement, especially in large units.*

A Unit Convenor (Science) said:

*I have been using MEAP+ for STAT1XX and I am really impressed with the ease with which I can now identify and contact students at risk. With a cohort that currently consists of more than 1200 students, and in some semesters can be almost twice that size, I have not previously had any simple way of doing this. My aim is to use MEAP+ to identify students who may potentially get 'lost in a system'.*

Although some students understand that this contact is at scale, they still appreciate the personalised message they receive from their unit convenor. Following is a comment from a student from the 2015 survey.

*Considering that this unit is almost external (i.e. our lectures are all online but our tutorials are in person), you don't expect the lecturer/unit convenor to know who you are, so for him to reach out to the students (after discussing with other students, we realised it was probably on a mass scale) added a personal level that you'd usually get by going to the lectures but that he managed to do without us meeting him personally.*

There is evidence that where MEAP+ is used, it can help retain students that would otherwise leave the unit. For example, a unit convenor from the Faculty of Arts used MEAP+ to identify a number of students that were disengaged and at-risk of not completing the online unit. S/he identified 26 students and sent them all a personalised email. One of the students wrote back and said:

*Hi <Unit Convenor Name>, Just checked my results and I cannot believe it that I got credit given the way I started. Can I say big thanks to you for the email you sent to me on 13/04. I had just logged on to my account to withdraw from the unit when I read your email and that prompted me to continue with the unit because I realized that there was someone out there who cares. Much Appreciated! Thanks once again.*

#### **7.3.1.2 Enhanced Convenor Capability to Improve the Student Learning Environment**

In order to support students' learning, teachers not only need to identify and contact students during the study period, they must constantly reflect and improve on the learning environments that they create to facilitate their students' engagement and learning. As shown in the SEAS model, in an online environment this can be particularly difficult due to the large number of interactions between students, content, activities and assessments. Where teachers understand how students are learning or engaging in the online environment, they can better design learning experiences that lead to improved learning outcomes.

The unit convenors can benefit from the analysis and impact each of the indicators MEAP+ provides on the difficulties students face in an online learning environment. As a result, they reflect on the information provided by MEAP+ and use it to adapt their unit. This contributes to ongoing development and improvement of online units. Following are the quotes from the unit convenors.

A Unit Convenor also a Head of Department said:

*The tool has also helped me reflect on the learning design for my unit. In tracking the students' progress in the various different assessment tasks, I have gained an insight into how the cohort approaches the completion of the unit's requirements. In redesigning the learning tasks over the summer (in a renovation of the unit) I have been able to take this into account.*

A Unit Convenor (Arts) said:

*I will definitely do things differently. I love contacting them in week 1, and going where the hell are you?. So the idea that you would reach out really early is something that really came home to me...the big teaching lesson for me from this exercise [using MEAP+] has been, they don't logon...It struck me that you need activities early in the session. I can't leave all the activities till the essay is due in the middle of the session.*

MEAP+ has improved the student learning environment by supporting convenors to efficiently and quickly identify and contact students early in the session through targeted personalised emails. The contact between a convenor and student early in the session can provide the student with timely support that can shape and influence their motivation to continue and re-engage with the learning environment.

A First Year Teaching Co-ordinator (Science) said:

*I've only been using MEAP+ for a few weeks, and already it is proving invaluable! After some initial time deciding what indicators point to an at-risk student, I was able to quickly determine which S2 students needed some extra attention in the first few weeks of semester. This tool is particularly useful for me since I am responsible for five large first year biology units, making it so much easier to recognise and contact students that are struggling to log on consistently or to meet deadlines. So far I have sent over 150 emails and have had a very positive response from students. They seem to really appreciate the concern, particularly because they are new to university.*

The student survey conducted in session 2 2015 since MEAP+ was functional (chapter 4) demonstrated that students acted on emails received from convenors, with over 76% reporting that they took follow-up action. They also reported that being contacted by convenors contributed to their motivation and engagement in the unit. For example, after receiving an email from MEAP+ changed how they studied for a unit by making them start to engage more with the readings and/or forums (62%), complete missing assignments (40%) and realise that they needed help (25%). An important aspect of learning is a supportive and caring environment. Convenors are uniquely placed to provide an optimal learning environment for

students. Convenors used MEAP+ to send supportive emails to students that are demonstrating engagement and achievement in the unit.

When we asked students in the survey, “what impact receiving an email had on how they viewed their convenor?” a student said:

*Acknowledgement of the fact that I hadn't completed the work by someone other than myself is quite unsettling sometimes. However, I'm glad I was contacted as it motivated me to complete the work and almost “show” the unit convenor that I could do it.*

### **7.3.1.3 MEAP+ Recognition**

MEAP+ has gained recognition from convenors, student support staff, senior management and the higher education community.

An Associate Dean, Learning and Teaching said:

*MEAP is a Moodle plugin originally designed to help convenors identify and contact students at-risk of not completing their unit. In the simplest terms, its aim was to improve student unit completions. It is very clear, however, that over the period 2015-2017 this research has radically enhanced the pedagogical and analytic parameters of the original digital tool. In addition to this substantial contribution to monitoring, supporting and assuring the quality of our students' learning experience, it is equally clear that a significant percentage of students enrolled in programs and units of study using MEAP+ actively follow up on contact initiated by the tool. As a result, students have provided feedback to unit convenors participating in the ongoing MEAP+ trials confirming that such communication helped them to persevere with and complete units from which they would have otherwise withdrawn.*

A Unit Convenor also a Head of Department said:

*I have recommended the tool to colleagues in my department, and those who have used it have found it useful too. I intended to make use of it again this year when I run my unit in the second session.*

A Student Experience Officer - Student Success (Business) said:

*MEAP has enabled me to support convenors in sending personalised emails to students, targeting specific behaviours. This personalised attention from the unit convenor seems to have a positive impact on students, with many responding to thank the unit convenor for their concern.*

The success of MEAP+ at an institutional level is evidenced in MEAP+ having become an institutional tool supported by our Learning and Teaching support staff. In the 2017, MEAP+ was successful in being awarded twice. (1) Macquarie University-Faculty of Arts Learning and Teaching Award titled “For service

innovation in the design, development and implementation of a learning analytics tool that supports learning and teaching”. (2) Macquarie University Vice-Chancellor’s Citation for Outstanding Contributions to Student Learning titled “For developing and leading an innovative learning analytics solution that has influenced and enhanced learning and teaching and the student experience.”

## **7.4 Case Study 5: Session 2 (Oct 2017 – Dec 2017)**

A qualitative case study 5 was conducted in session 2 from October 2017-December 2017. The sample for this study included participants recruited from 10 undergraduate units representing three faculties: Arts (6), Humanities (1) and Science (3) units. The same unit selection criteria was used as with other case studies that is units with large enrolments and with >10% of failure rates in the last offerings. Units with online activities in iLearn are chosen. The online activities included forum posts, learning activities, assessment tasks such as quizzes. This is to ensure that students spend time in iLearn and complete a number of tasks so that the MEAP+ can collect sufficient data on student activity to generate a value for the level of engagement.

### **7.4.1 Design and Procedure of Case Study 5**

The student surveys were open to all students enrolled in the 10 units (around 3496 students). The participants were initially invited by the unit convenor with an invitation message on the news forum of the respective unit iLearn pages to fill in an online questionnaire. In our institutional LMS, students also receive the announcements in their university email. The survey structure and questions used in case study 5 was quite similar to the one used in the earlier case studies. There were few questions related to alerts and actions taken as a result of a response to an intervention included as open-ended questions. A copy of the questionnaire can be found in Appendix J.

Students completed the questionnaire on a voluntary basis. MEAP+ was used to send the alerts. The descriptive analysis was done using SPSS 23.0 and analysis to the open-ended questions was done using NVivo Plus 11.0. The next section presents the results.

### **7.4.2 Results of Case Study 5**

From the 10 units 56 students agreed to participate by checking the information and consent statement radio button. After screening for usability and reliability, 43 responses were found to be complete and usable. Section I collected student demographic information including an identifier (Student ID) so that we can match their achievement in the unit from another database. Table 7.2 presents the selected basic demographic attributes of our respondents.

In Section II, questions related to early alerts and actions taken as a result of a contact or feedback were included. The respective questions with their analysis are presented next.

#### **Would students like to receive early alerts about their performance? Explain why?**

In an open-ended question, students were asked to explain why they would like to receive early alerts about their academic performance. More than three-quarters of the respondents (33 students) responded to this question, 30 students responded 'yes' they would like to be contacted and only 1 student mentioned that s/he don't like to be contacted. One student responded as in the 'unsure' category as they like to be contacted, such as "... depends, on quality of message, whether metric used is adequate [and] tone of language." Another student mentioned that because they can check their results online and get a general idea of how they are performing so s/he wants to get an alert only if s/he is performing well as, "... it was reaffirming to receive notices when I was doing well & helped motivate me to keep going."

We tried to code students' reasons why they wanted to get an early alert but it was hard as none of the students identified any specific reason/s as when they like to be contacted or for what specific reasons. There were general comments regarding their performance in the unit or as a reminder to prompt them to study enough to be successful in the unit.

**Table 7.2: Case Study 5-Student Demographics**

<b>Basic Demographics</b>	<b>Respondents</b>	
	<b>N</b>	<b>%</b>
Number of respondents	<b>43</b>	
Gender		
Male	9	20.9
Female	34	79.1
Age (years)		
18 or younger	8	18.6
19-24	27	62.8
25-34	5	11.6
50 or older	3	7.0
First Language		
English	38	88.4
Other than English	5	11.6
Ethnicity		
International Student	1	2.3
Aboriginal/Torres Strait Islander Student	1	2.3
Neither	41	95.4
Enrolment Status		
Full-time	35	81.4
Part-time	8	18.6
Student Status		
1 <sup>st</sup> year student, 1 <sup>st</sup> semester student	4	9.3
1 <sup>st</sup> year student, 2 <sup>nd</sup> semester student	2	4.7
Continuing student (2 <sup>nd</sup> year, 3 <sup>rd</sup> year or above)	24	55.8
I came from another university	11	25.6
Other	2	4.7
Faculty		
Arts	18	41.9
Business and Economics	3	7.0
Human Sciences	6	14.0
Science and Engineering	14	32.6
Medicine and Health Sciences	2	4.7
Employment (Hours)		
< 5	2	4.7
5-10	6	14.0
11-15	7	16.3
16-20	11	25.6
> 20	8	18.6
Not working	9	20.9

*Note:* Totals for a particular demographic question may do not add to 43 as of missing values

### For what specific behaviours do you want to be contacted?

The broad-brush coding was applied in NVivo Plus 11.0 on the responses for this qualitative question. The following Table 7.3 shows the summary of the behaviours respondents identified.

**Table 7.3: Case Study 5-Frequency of students for what specific behaviours do they want to be contacted**

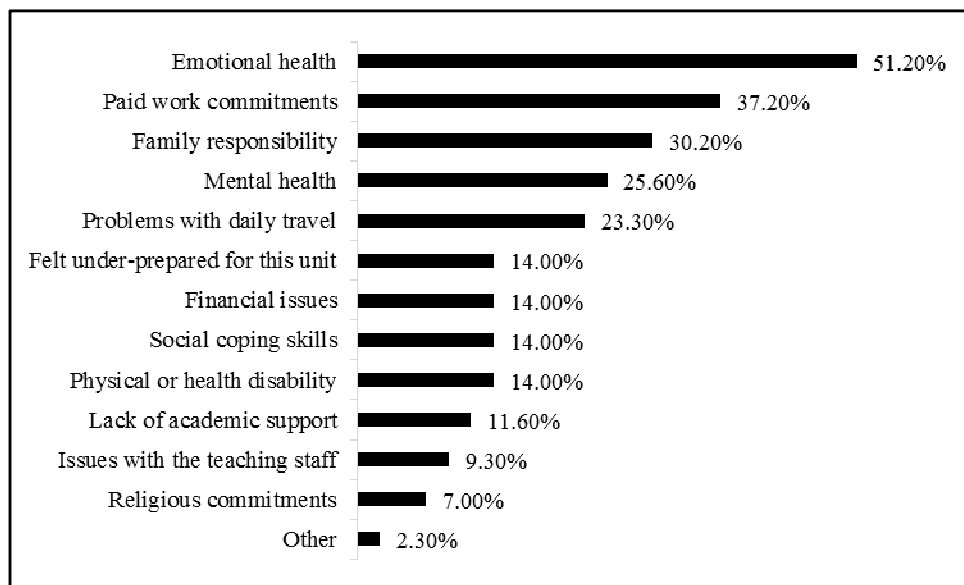
Specific behaviours students want to be contacted	Frequency
Performance-over all	8
Low scores in assessments	8
On best assessment results	7
Lack of participation	6
Falling behind	5
Lecture content/resources not viewed	4
Frequent absences	2
Not logged into iLearn	2
Performance-when I am doing well	2
Reminder for assessments (due soon)	2
No participation in discussion forums	1
Missing work	1
None	1

The results were consistent with the earlier case studies that students want to be contacted for their performance in the unit, assessment results, lack of participation, if students are falling behind and engagement with the unit content.

### Students' Consent to the Use of Their Data

The students were asked a question for permission to use their data in iLearn, or other academic data held by university, to be used to identify and send early alerts about their performance. Of the 43 respondents, 33 responded to this question (Missing=10, 23.3%). 28 students (65.1%) responded that they *agree* and 5 students (11.6%) are *not sure*. None responded to *disagree*.

In another multiple response question based on 'mark all that apply', N=33 (Missing = 10, 23.3%) students were asked about which of the following factors, impeded students' academic performance in this unit in session 2 2017. The students referred mostly to emotional health (49.2%), paid work commitments (37.2%) and family responsibilities (30.2%) (Figure 7.2). Totals do not add to N as they were multiple response questions and the participants could check all or no checkboxes. Figure 7.2 shows the selections from most to least common.



**Figure 7.2: Case Study 5-Factors affecting student performance in the respective unit**

The survey also investigated whether a student had been contacted by a teaching or student support staff at any stage about their academic performance in this unit. Of the 43 respondents, 33 responded to this question (Missing=10, 23.3%). The majority of the students 22 (66.7%) said that they were not contacted by a teaching or student support staff at any stage about their academic performance. Only 11 students (33.3%) said that they were contacted by a teaching or student support staff about their academic performance (Table 7.4).

**Table 7.4: Case Study 5-Respondent Self-reported Early Alert Notification Received**

	N	%
Yes	11	33.3
No	22	66.7

**Did you follow-up or take any action as a result of the early alert notice? What specific action(s) did you take when you were contacted?**

Out of 11 students contacted by the teaching staff for their academic position, 6 students (54.5%) said that they did not follow-up or take an action and 5 students (45.5%) said that they followed-up or took an action. The follow up actions specified by the students were studying to achieve higher results, emailing teaching staff and completing the required tasks Table 7.5.

**Table 7.5: Case Study 5-Specific actions students take when they were first contacted**

Description		N
Specific actions student take when they were first contacted	Studied more to achieve higher results	4
	Emailled teaching staff and completed the required tasks	1

### **What was your attitude receiving an early alert or intervention?**

Out of 11, 10 students responded to this question. After running a word frequency query, the frequent terms we found were, appreciated (3), positive (3), encouraging/supportive (2), happy (2), congratulating (1) and cared (1).

### **Did receiving an email from your teaching staff change how you studied for this unit? If so, please provide details. What did you change or do differently?**

Out of 11, 10 students responded to this question. The number of 'yes' and 'no' answers were equal (4 of each), along with 2 'not applicable'. The students who responded 'no' to this question did not provide any comments. Four students who responded 'yes' to this question, talked about feeling motivated, more engaged with their studies, feeling confident to try harder and feeling that they are not alone and someone cares about them.

Following are the comments from the four students who responded 'yes' to this question.

Student 1:

*Felt supported no matter what grade I received, and felt like we were a team working together to reach the best possible result for me as a student. Also felt like the tutors cared about my wellbeing.*

Student 2:

*It motivated me to continue achieving a good standard of work. With full time work I find it can sometimes be a balancing act and it is easy to fall behind with study if you don't dedicate time to it on a weekly basis.*

Student 3:

*I continued in the unit and having the positive feedback gave me the confidence to try harder.*

Student 4:

*Previously, I had only been half-heartedly doing my assignments and rarely doing my homework activities. After the alert though I started to do my homework activities and I was also able to catch up with any content that I had missed. I actively participated more in class and often asked my tutor questions whereas before I was hesitant to ask or answer questions in case my question was too dumb. I still thought at times that my questions may not be appropriate, but I guess I had gotten over that fear.*

**What impact did receiving an email from your unit teaching staff have on your motivation to continue in the unit?**

Out of 11, 10 students responded to this question. No new categories were found so we grouped the responses in the same categories as of our other case studies such as ‘felt better’ (8), ‘felt as I can improve’ (1) and ‘no impact’ (1). There was no response having the ‘felt worse’ feeling.

**Were you advised to seek help from teaching or any student support services?**

In a question, when asked whether they had been advised to seek help from any teaching or student support services. Out of 11, 10 students (23.2%) responded to this question and all marked as ‘no’ that they have not been advised to seek help from any teaching or campus support services.

None of the students responded to the follow-up questions that whether they actually accessed any campus support services after receiving an email from their unit teaching staff.

### **7.4.3 Discussion**

The main purpose of the case study 5 was to tie up the student perspectives about receiving alerts for their academic performances, behaviours regarding whether they like to be contacted, specific actions taken when contacted and attitudes towards receiving an alert or intervention. The results were consistent with the earlier case studies. Majority of the students would like to be contacted for their academic performance especially for assessments results (both low scores and best) and lack of participation. In line with the earlier studies, most of the respondents agreed to consent the use of their student data for early alerts. Emotional health, paid work commitments and family responsibility were the most reported factors hindering the student performance. One of the reasons could be that more than half of the respondents were working more than 16 hours per week. From the contacted students only around half followed-up with their teaching staff or took an action such as ‘studied more to achieve higher results’. The students’ attitude towards receiving an intervention was very optimistic as they found the interventions and alerts very positive, supporting and encouraging. After receiving an email from the teaching staff, students reported being motivated to continue in the unit, which is a good outcome of an early alert.

## **7.5 Summary**

The goal of this chapter was to present the ratification of the MEAP+ system and its impact on developing the organisational capacity at our institution (section 7.2). MEAP+ went from a tool available only to a small group of unit convenors to all unit convenors on the institutional LMS. Section 7.3 summarised the current standing of MEAP+, its significance and recognition to enhance unit convenor's capabilities to better support students and to improve the student learning environment. An additional case study was then presented to sum up the student perspectives related to receiving alerts.

The next chapter will provide a research review including the summary of contributions, limitations, future work, and present implications and recommendations.

## **8 CHAPTER: CONCLUSIONS, RECOMMENDATIONS AND FUTURE WORK**

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### **8.1 Introduction**

This research has sought to investigate the students' and teachers' perceptions on the use of learning analytics to identify disengaged students/at-risk students and/or suggest intervention/s using student early alert systems. The purpose of this chapter was to draw conclusions based on the empirical findings presented in two chapters (chapter 4-student perspective study and chapter 5-teacher perspective study) and answer the research questions posed in the introductory chapter (chapter 1). This chapter also discusses theoretical implications of the conceptual Student Engagement and Academic Success (SEAS) framework presented in chapter 6 and the ratification of the MEAP+ system based on its impact in developing the organisational capacity around learning analytics at our institution (chapter 7).

The chapter is organised into four sections. Section 8.2 summarises the research carried out and reminds the reader of the aim and objectives of the current research. Section 8.3 reviews the main research contributions by establishing a link between these contributions and the fulfilment of the research objectives. Section 8.4 provides a recap of key answers to the research questions. Section 8.5 discusses the limitations and future work. Section 8.6 outlines implications and recommendations. The final section (8.7) concludes the research.

### **8.2 Research Review**

The implications for HEIs, including our own institution, of the research completed to date are that learning analytics systems need to be made available to help teachers to gauge student behaviours and identify students at risk and enable teachers to contact students to improve student retention and their learning experiences. The research has overwhelmingly shown that students want to receive early alerts as soon as their performance is not adequate. They value the personalised messages they receive as it positively contributes to their learning experience. These messages can help to motivate students to engage in the unit and help them to realise that they need to seek additional support. In addition, students report that these

messages personalise the unit for them. Students appreciate that the convenor is concerned about how they are performing in the unit.

Given the consistency and strength of the support received, ignoring this desire could almost be seen as a breach of duty of care. This support also changes the focus of concerns about access to student data. The questions to be answered change from ‘can we’ or ‘should we’ to ‘how’ and ‘how soon’? Not only does this thesis answer, *yes we can* and should *use student data* to provide early alerts, in answer to *how*, this thesis has explored the triggers used by teachers to identify at risk students, the feedback and support they provide to students and the medium through which students wish to receive the alert (i.e. university/personal email accounts) and receive support to change their performance (i.e. face to face from teaching staff).

The research sought to achieve the following objectives:

1. To study the perspectives of students and teachers regarding early alerts and the potential benefits and barriers to the early alert system usage.
2. To develop a conceptual Student Engagement and Academic Success (SEAS) framework that ties theory to practice.

Student engagement, retention and academic achievement/success have long been a focus of research in higher education (Kahu 2013; Skinner & Pitzer 2012). Moreover, attention to the use of learning analytics to understand students’ behaviours in LMS and to identify and contact at-risk students (Arnold & Pistilli 2012; Jayaprakash et al. 2014; Romero & Ventura 2013; Slade & Galpin 2012) to increase and support student engagement as a means to improve academic success, retention rates and support timely graduation has heightened exponentially in recent years (Clow 2013; Gasevis, Dawson & Siemens 2015; Greller & Drachsler 2012; Pardo & Siemens 2014; Siemens & Long 2011). This research was grounded on Tinto’s theory of student departure (1975), Bean’s theory of student retention (1980), Astin’s theory of student involvement/engagement (1993) and Swail’s geometric model of student persistence and achievement (2004) to conceptualise the possible impacts of learning analytics on student learning aimed at discovering students’ and teachers’ perceptions of the early alert process and the use of a student early alert system to aid the process.

Chapter 1 of this thesis provided an introduction to the research undertaken and the appropriate background information. Moreover, it discussed the study aims, research questions, the theoretical model and the thesis structure and layout.

Chapter 2 reviewed the relevant literature. The chapter started by describing the terms: student engagement, retention and academic success and then discussed the factors that contribute to student withdrawal. The next section included the various theories and factors that lead to student withdrawal and provide a theoretical framework in this study. Furthermore, this chapter presented the analytics in higher education with a focus on learning analytics processes, models, benefits and challenges. The last section of the chapter presented the concept of early alerts and a summary of the international and national learning analytic tools.

Chapter 3 described the methodology which was applied to reach the objectives and to get answers to the research questions defined in chapter 1. This chapter also discussed the research site that is Macquarie University, its organisational context and the IT systems used at Macquarie University. Based on the factors recognised from the literature in chapter 2, the last section of this chapter drew together the summary of the relevant data held in some of the Macquarie systems.

Chapter 4 discussed the student opinions and preferences with respect to early alerts. The work discussed in this chapter represented achievements with respect to research objective 1. The student perspective was investigated over a three-year period from 2013 to 2015 via a pilot study, and four follow-up quantitative studies. Furthermore, the questionnaire development process was discussed which included: the questionnaire content and structure in relation to the literature and with the theoretical framework for this study; the instrument validity and reliability; significance tests of potential non-response bias; and the analysis of the data (results) were presented in this chapter. The analysis included the descriptive statistics; decision trees analysis to explain whether the early alert system has increased student's academic performance and/or motivation to continue in the unit; and behavioural analysis to interrogate the LMS logs for student's specific analyses of behaviours before and after receiving an early alert or intervention email.

Chapter 5 presented the teacher perception of the early alert process and the potential challenges to the use of a student early alert system. The work discussed

in this chapter also represented achievements with respect to research objective 1. The teacher perspective study used a qualitative method, interviews, to explore teachers' perspectives regarding the benefits and barriers to the use of early alert systems.

Chapter 6 provided an overview of the linkages between the theoretical framework literature review (Chapter 1 and 2) and the student and teacher perspective findings and discussion (Chapters 4 and 5). This allowed us to answer the research question related to research objective 2.

Chapter 7 provided an enactment of the MEAP+ system at our institution and its recognition through quotes from teachers and students and the receipt of institutional awards. This chapter also allowed us to bring together the literature from Chapter 2 and to further validate our findings from Chapter 4 through the capture of qualitative data where the questions asked in Chapter 4 have been utilised but the responses are open-ended rather than restricted. We seek to confirm that important options and concepts were not overlooked previously and also to confirm that our quantitative and qualitative results are consistent.

The work presented in each chapter added to the achievement of the specified research objectives. To achieve the above objectives, the central research questions related to the first objective are:

From Students' Perspective:

- What are the opinions and preferences of students with respect to early alerts?
- What is the attitude of students receiving an early alert/intervention?
- Do students report change in behaviour for how they studied for a unit, if they actually receive an early alert?
- Do early alerts increase student performance and motivation to continue in the unit?
- Do early alert notifications increase student motivation to utilise the campus student support services?

From Teachers' Perspective:

- What are the perceptions of teachers with respect to early alerts?
- What information would the teaching staff find meaningful to include in a student early alert system?
- What are the potential barriers to early alert system usage?
- What are the experiences and motivations of teachers with regard to usage, helpfulness and barriers/challenges to the use of a prototype early alert system?

The essential question related to the second objective is:

- What are the key concepts and their relationship that comprise a conceptual Student Engagement and Academic Success (SEAS) framework including the student and teacher perspective?

## **8.3 Summary of Contributions**

A summary of the main thesis contributions are presented below.

### **8.3.1 Theoretical Framework**

The aim of this research was to understand student engagement, retention and academic success at the unit-level. The theoretical framework introduced in chapter 1 helped to provide a foundation to understand the learning behaviours of students. There is no one single theory or model that explains students learning behaviours or factors that can contribute to retain students at the unit-level. Moreover, the existing theories or models do not fully explain or encompass the changes that have happened in the higher education sector since they were espoused, such as use of LMS, rise of blended learning, ubiquitous content, use of digital technologies or social media in learning as well as massification and globalisation of higher education. Our framework is built on Tinto's theory of student departure (1975). We added components from Bean's theory of student retention (1980), Astin's theory of student involvement/engagement (1993) and Swail's geometric model of student persistence and achievement (2004). The components of these models were selected as theoretical concepts to describe the characteristics of at-risk students and provide (personalised) interventions.

In this thesis, the theoretical framework and related literature were utilised to initially understand the characteristics, behaviours and motivation of students to persist within a unit. This framework was used to design our data capture instruments. The framework also provided a basis to understand the research area and directed the study to other literatures such as student-teacher interaction, learning analytics and ethics of accessing and using student data.

### **8.3.2 Understanding the Student Perspective**

This thesis aimed to gather the opinions of students across our institution covering all faculties. It was important to know the students' preferences and attitudes to being contacted because use of a student early alert information system means students view the alerts as a positive part of their learning even if the alert is highlighting their low or poor academic performance and seeks the student to change their behaviour. Understanding student perspectives regarding early alerts is an important strategy to improve and increase student engagement and their academic success at a unit-level.

### **8.3.3 Understanding Teacher Perspective - Barriers to Usage**

This thesis aimed to capture the opinions of teachers because in any unit (in blended mode or online), teachers are the ones who are engaged with students and are the best means to provide timely support (or interventions) to less engaged or at-risk students. Using a student early alert system usually requires teachers to act upon the information captured about the student academic performance in a way that would encourage students to change their behaviours. Knowing the teachers' perspective is important because if teachers' are not favourable to the concept of an early alert system and if the barriers to usage are too high, then they would not use such a system, even if students want them and benefits are perceived.

### **8.3.4 Student Engagement and Academic Success (SEAS) Conceptual Framework**

This PhD thesis aimed to propose a student engagement and academic success conceptual framework that could be used as an investigative tool or means to understand the various factors that affect student engagement and success within a unit. The core elements of our proposed conceptual framework are derived from the

theoretical framework (chapter 1 and 2), student perspective study (chapter 4) and teacher perspective study (chapter 5).

## 8.4 Answering the Research Questions

This thesis aimed to study the student and teacher perspectives to early alerts. As a first step, we aimed to find out whether a student wants to receive an early alert, when, how and in what form they want that alert to take. Therefore, the first research question was proposed:

*What are the perspectives of students and teachers regarding early alerts and the potential benefits and barriers to the early alert system usage?*

To answer this research question, we conducted two separate studies and named them as *student perspective study* and *teacher perspective study*. Both of these studies contain separate set of questions as reproduced in section 8.2. The *student perspective* related questions were answered in chapter 4 and *teacher perspective* questions were answered in chapter 5.

To know the student perspective regarding early alerts, we conducted a pilot and 4 subsequent full studies. The results of all studies regarding early alerts were consistent (Figure 4.28). For example, all studies including the pilot show that the majority of students like to be contacted if their performance in the unit is unsatisfactory. In each study, they like to be contacted as soon as it occurs. They like to be contacted for low scores in assessments, missing work, frequent absences and lack of participation. All students contacted would like to know about the opportunities to seek assistance via (university or personal) email, then face-to-face, then (mobile) phone.

The student perspective results are somewhat consistent with the teacher perspective study where the teachers preferred to restrict alerts to strategic time points such as either before census date and/or when the assessment tasks are due. In agreement with students, teachers want to use email as a primary form of contacting student.

Knowing the student and teacher perspective helped us to identify the essential factors and their inter-relationships to answer the second research question:

*What are the key concepts and their relationship that comprise a conceptual Student Engagement and Academic Success (SEAS) framework including the student and teacher perspective?*

This question was answered in chapter 6. The resultant conceptual SEAS framework helped to understand the various factors that can impact student success at the unit-level.

## **8.5 Limitations and Future Work**

In chapter 1 we outlined the scope of our study. These delimitations defined the thesis boundary. These delimitations such as data capture within a single institution, rather than multiple, focus on early alerts within learning analytics and focus on perspectives rather than behaviours or outcomes, all present limitations of our study and the opportunity for future work. Below a number of further limitations are discussed.

### **8.5.1 Theoretical Limitations**

In this thesis, we presented our theoretical framework to describe the components in our student engagement and academic success (SEAS) conceptual framework. Each of the theories that were drawn upon have been separately validated in previous studies. In order for our eclectic theoretical framework to be widely applicable and accepted, further studies are needed at different institutions.

Limitations include the fact that this study was not longitudinal in nature, following students until the end of semester only. Also, ideally we would have compared whether the use of MEAP improved student outcomes and also tracked individuals who received alerts to see if they passed or failed the unit in the end. Since grade data was not made available to the researcher, despite being requested more than once and approved by ethics, this has not been possible and limited the sophistication of the statistical analysis that could be provided for all the units. The LMS (iLearn) logs capture student data as their 'User Full Name' and the MEAP logs capture interventions sent to students by the student email address as 'Destination Address'. Due to the different credentials used in the logs and survey it was difficult to track students who received an alert but did not respond to the survey. Again, due to student data ethics and privacy, we were unable to track

students in any of the units for their behaviours (or achievements) after they decided not to respond to the survey. Though, we did conduct behavioural analysis of random students in a 100-level unit offered within our unit as we had access to the live LMS log and grades (section 4.8.3.8).

Comparison with other studies was also limited as there is only a small body of work in this area and other systems are not exactly comparable, often using different data sources and types and not focussed on early alerts at the unit level.

Participants' responses were self-reported. While we assume that all of them gave honest responses, still we believe that social desirability (Nederhof 1985) and other forms of bias are possible. An attempt was made to remove the response bias by including questions with a combination of positive and negative phrased measuring items. However, there were not many which we include as a limitation. As presented in chapter 4, the student perspective instrument was assessed for validity and reliability. In chapter 5, questions were evaluated for qualitative validity and good inter-rater reliability was reported for the thematic analysis conducted. This study was conducted at one institution; therefore, the results can only be generalised to peer institutions with similar enrolment and student populations.

### **8.5.2 Data Limitations**

Another limitation was our inability to recruit more unit convenors to trial MEAP+. While, we did attempt to address this issue through presentations and discussions with unit convenors and seeking support from associate deans and directors of learning and teaching and heads of departments, there was little success. For example, in case study 3 (S1 2015), approximately 30 units were recruited but only 14 participated. Furthermore, some participating unit convenors did not use MEAP+ to send alerts and/or use MEAP+ frequently.

Recruitment of unit convenors has a follow on effect on the number of students who are invited to participate in the study, as it was necessary for them to participate in the context of the prototype being available in their unit. As a result, we were unable to obtain as much data as we would have liked, reducing the strength of the research findings that we will eventually make.

As mentioned earlier, the data was collected from a pilot and 4 follow-up studies. All participants in these studies were limited to those enrolled in undergraduate courses on board for the respective study.

Finally, since convenor and student participation was voluntary, the opinions of those who chose not to participate have not been captured. This data limitation impacts the volume and scope of our data and generalisability of the results.

### **8.5.3 Technical Limitations**

There were some limitations of MEAP that impeded use of the system and its use to identify and contact students at risk. The main limitation was the ‘update’ of the data, as the prototype was not on the live server and the data was up to 4 days old. Also, the prototype MEAP was taking data from iLearn only and was not connected to other systems in the institution. Finally, the prototype MEAP+ presented the student data in report form (tables), some teachers think that more graphical and visual information could be added.

### **8.5.4 Practical Limitations**

Use of any tool and approach requires some training, commitment and expertise. Using the tool appropriately, requires teachers to become choice architects where the teacher has “the responsibility for organising the context in which people [i.e. students] make decisions” (Thaler & Sunstein 2008, p. 2) and provides interventions/emails that act as nudges, i.e. “any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid” (Thaler & Sunstein 2008, p. 5).

The use of the SEAS framework and supporting tools like MEAP+ are limited by the time constraints faced by teachers and support staff. Teachers who are adjuncts or sessional staff may not feel they are sufficiently remunerated and/or trained to identify students and send early alerts. Continuing academics/teachers are likely to have other pressures such as research, administration and service tasks. At our institution the typical workload model is 40% teaching, 40% research and 20% administration/service. Academics are stressed, they are pushed from all angles, to publish, to move to online, blended learning, to learn new technologies, usually on their own time.

In addition, while the SEAS framework is cognisant of the big picture, tools like MEAP+ are only able to analyse a subset of the data, i.e. the data stored in the LMS. It does not capture classroom and face to face activities. Furthermore, even when units are blended then there will be activities, such as class and tutorial attendance, which will not be captured by MEAP+ without spending time to enter data, adding further to the workload issue.

In section 8.6, several practical recommendations are offered towards addressing various current practical limitations.

### **8.5.5 Future Research**

Following are the recommendations for areas of additional research as indicated from the outcomes and findings of this PhD research.

1. Expand the research regarding the longitudinal impact of a student early alert system on student performance, retention rates or graduation rates. For example, from first year to second year or during the whole undergraduate candidature (until graduation). This may build up to more administrative, faculty and financial support for system usage.
2. Replicate this study in graduate units or research degrees as this may result in varying outcomes and findings.
3. Extend the teacher perspective study to triangulate the self-reported data with some form of other data from the teacher LMS logs such as number of messages send per student.
4. Conduct replicated study on multiple institutions to determine the consistency in outcomes across institutions of similar size and type.

## **8.6 Practical Implications and Recommendations**

The purpose of this section is to outline the lessons learnt from this PhD project to inform the future use and application of learning analytics tools (such as early alerts and interventions) specifically at Macquarie University<sup>29</sup>, but potentially at other institutions according to their needs and culture.

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<sup>29</sup> These recommendations were submitted by the research team to our university following the conclusion of the Teaching Development Grant.

Some of these recommendations either require additional work on MEAP+ or around learning analytics in general.

### **8.6.1 Administrators, Educational Leaders and Senior Executives**

The implications of this PhD project are that if institutions want to improve the student learning experience and retention in blended units, they should:

1. Provide teaching staff, particularly unit convenors, with a system that allows them to contact students via their university email address when their online performance is not adequate. The system must allow unit convenors to send emails quickly and efficiently to reduce duplication and workload issues.
2. Adopt a whole program approach to using learning analytics and look at including a student support officer to coordinate the use of learning analytics with teachers.
3. Target the use of learning analytics for large, first year units.
4. Encourage teachers to think about designing their online unit so that different types of data from online activities may be collected. This will surely help in increasing accuracy of learning analytics tools.
5. Set measurable goals for the improvement of student retention through the use of learning analytics.
6. Set up governance structures and institutional policies (Code of Ethics and Code of Practice) around the use of data to guide development and implementation of learning analytics, reducing duplication and increasing collaboration across projects.

### **8.6.2 Teachers (Unit Convenors)**

We recommend that unit convenors:

1. Inform students that they are overseeing their students' online performance and that their students may be contacted during the semester. This approach meets good practice and ensures that students are fully informed and not surprised during semester.

2. Consider using a learning analytic tool such as MEAP+ to engage in timely email communications with students about their online activity and performance to improve student engagement. MEAP+ facilitates email contact between unit convenors and students. In addition, it provides information about students' online activity that can be used to provide targeted emails by convenors. Almost half of the students (44%) reported that they wanted to be contacted by university email if their performance was unsatisfactory (79.4%) as soon as possible (20.6%). Students report that when they received an email from the unit convenor using MEAP+ they took follow-up action (73.9%). They reported that they: got attentive and started to work seriously (38.6%), emailed teaching staff and asked for help and information (37.3%).
3. Use MEAP+ to engage in timely email communications with students about their online activity and performance to improve student motivation. Students value contact with unit convenors. Students reported that receiving emails from convenors made them feel like they could improve (44.6%) and made them feel better about their unit (45.5%). An example of the impact on student motivation of receiving an email from a convenor, is given by a student as follows "Given the fact that the unit convenor took the time to send an email shows his enthusiasm about teaching this unit and his willingness to engage with the students. He goes beyond his obligations as a lecturer and shows genuine concern about the students' performance, something that I haven't experienced in any of my previous units."
4. Pay attention in composing messages to students about their performance and online activities and work with the student support officer or other professional staff to compose effective messages. Students reported that receiving emails from convenors, in some cases made them feel worse (9.9%), hence care needs to be taken in message composition. Convenors should outline why the performance or activity is an issue, carefully choosing their words so that they are not misinterpreted, but also include suggestions for improvement or further support so the student can actually take steps to address or improve the issue. They should aim to provide constructive feedback and avoid definitive statements like 'you are at risk of failure' or imply that the student is lazy as this can lead to negative

feelings from students and be counterproductive. MEAP+ has messages that the convenor can use to help them compose well written, supportive messages. Examples of the impact of poorly worded messages on students, from their comments in the survey include “Made me very annoyed, emailing me for missing one class and telling me I’m at risk of failure for missing one class!” and “Being labelled as lazy when you’re doing your best and don’t have any other choice is quite sad”. MEAP+ provides categorised message snippets that can be modified and convenors can save their own messages to allow customisation to multiple groups according to specific differences. For more information and suggestions look at Appendix G (writing an email in MEAP+).

5. Consider using MEAP+ to not only contact students whose performance is below standard, but also to contact students who are performing well. The survey showed that students appreciate being contacted by convenors. It makes them feel that the convenor cares about their work and is interested in them as individuals. During the main study, some convenors used MEAP+ to send emails to students who were doing well in their unit. This was an acknowledgement of their efforts, and further encouragement for them to continue. MEAP+ has message snippets that the convenor can use to offer encouragement to students.
6. Consider using MEAP+ at strategic times during the semester. To maximise the impact of a tool such as MEAP+, as well as reducing the convenor workload, it should be used at strategic times during semester. MEAP+ should only be used from approximately the fourth week of a 13-week semester. This is because our research found from about this time there was sufficient data from student interactions in iLearn, for MEAP+ to become effective in correlating activity with final grades. MEAP+ could be used to remind students of the census date and the last date to withdraw without academic penalty. These two periods of time are when students should strongly consider their current online activity and whether they ought to withdraw from the course to avoid financial and/or academic penalty. MEAP+ has messages that the convenor can use in both these instances. MEAP+ should be used after the completion of major assessment tasks. This can result in targeted support to students who are struggling. It is particularly

important to contact students who have failed or not completed their first assignment. Messages should be sent when students have sufficient time to respond (e.g. submit on time/within an acceptable window, withdraw, and seek help). There is no point sending a message that does not allow the student to take any helpful action.

7. Consider selecting the MEAP+ indicators so that they align with the design of their online unit and assessment tasks. To ensure that MEAP+ is effective, the selection of indicators needs to reflect what students need to do to successfully complete the unit. These activities should also relate back to the assessment schedule for the unit as well as the assessment tasks. For example, if a significant part of the assessment for the unit involves online discussions in forums, then convenors should ensure that the forum indicator is selected when using MEAP+. Another way to think about setting MEAP+ indicators is to ask yourself, what should the student be doing online if they are engaged and on track to complete the unit? Then think about whether there are online activities that will allow students to demonstrate this? For example, if they are to demonstrate an understanding of basic concepts, is there an online quiz that they need to complete? Next think about what would be the most appropriate MEAP+ indicator that would provide evidence of student activity. Attention should be given to potentially adding activities to units and simply creating busy work thereby adding unnecessarily to the workload of the students.
8. Use MEAP+ to use student attendance as an indicator. Within MEAP+, first, create a manual grade item in the gradebook on iLearn. It could be hidden so it's not visible to students. Attendance could be either marked weekly or cumulatively. For the former, teachers need to create a grade item for every week; for the latter, one grade item is sufficient. A cumulative grade item could be tutorial attendance in weeks 1-6. Next a score indicating the tutorial attendance can be given to each student. For example, a 0 for non-attendance and a 1 for attendance in the grade item in the gradebook. If a student has attended the tutorials for the last 6 weeks, they would have a 6 in the gradebook. If they had attended 5 tutorials, they would have 5 in the gradebook and so on. Finally, when you select the gradebook indicators in MEAP+, select the manual grade item you've selected (for example, tutorial

attendance week 6) and choose the condition (for example, equal to 0). In this example, it would identify students who had not attended any tutorial in the last 6 weeks. If you are recording attendance in a spreadsheet already, you can import this data into iLearn and map it to the grade item you have created for attendance. This then allows you to use this data to identify and contact students about their tutorial attendance from MEAP+.

9. Encourage their teaching assistants and tutors to input results into Gradebook and student attendance data in a timely manner. MEAP+ requires up-to-date data in order to identify at-risk students accurately. Encouraging teaching assistants and tutors to keep up with manual inputs in Gradebook can help prevent students from being contacted in error. Being incorrectly contacted as at-risk can provoke unnecessary anxiety and annoyance in students.
10. Consider reviewing their use of MEAP+ at the end of the semester to inform their unit redesign. The use of MEAP+ helps unit convenors see how useful particular activities are in helping students complete the unit. For example, if they find that one of the activities they used in MEAP+ was not a useful indicator of a student's final performance, they might consider reviewing it to either make it more relevant or remove it and replace it with more effective activity. They might also think about creating new activities or using other indicators in future to improve the information they obtain on their students.
11. Ensure the messages include an offer of support. Instead of merely commenting on a student's poor performance, unit convenors should offer support by inviting students to see them in their consultation hours or suggest they see their tutor in their consultation hours, recommending students attend *PAL sessions* (if available in the unit), recommending the student make an appointment to speak to a Learning Skills Adviser, or make use of their *resources*, or contact the *Numeracy Centre*.
12. Unit convenors should refer particularly disengaged or poor-performing students to the faculty's student support team and/or Campus Wellbeing.
13. To facilitate the coordination and reporting of intervention with students at risk, unit convenors should share lists of students contacted, and the reason for contact, with the student support coordinators in their faculty. The use

of MEAP+ for early intervention is just one of a range of intervention programs of academic support and pastoral care employed by each faculty. In order to coordinate intervention efforts, the faculty's student support team should be informed of which students are being contacted by MEAP+, and why, soon after contact is made. This will allow the team to identify the students most at risk and provide additional intervention when necessary. It will also help the team to monitor known students at risk. In addition, it is important to be able to provide evidence of contact and support of individual students. We suggest unit convenors export an Excel list of students contacted and share this list with the student support team in their faculty.

14. Training sessions should be organised for teachers to use the MEAP effectively.

### **8.6.3 Student support officers**

We recommend that student support officers:

1. Work with unit convenors to help select indicators for MEAP+ and to compose messages.
2. Work with all unit convenors in their faculty to maintain an overview of students who are being consistently contacted using MEAP+. They should work with the unit convenor to support students who are struggling in their unit. They should also flag and develop policies and procedures to offer support to students who are being identified by MEAP+ across a number of units.

### **8.6.4 Program Directors**

Consider implementing MEAP+ across units in a program that have student retention issues. Having a consistent use of MEAP+ across all program level units will ensure that students have a uniform experience in their program. This approach will ensure that unit convenors work together in identifying and contacting students. We recommend that all unit convenors who will participate in the program-level intervention discuss the online activities they wish to use as indicators in addition to when MEAP+ will be used and the types of messages that will be sent. To ensure that students are not overly heavily contacted in their program, program directors (or delegated staff) should maintain an overview of which students are being contacted. This should occur preferably at the end of the week, where a consolidated

list of students contacted in the program for that week, together with the number of emails sent to each individual student is created and examined. If it is revealed that some students are consistently receiving emails from a number of unit convenors, then further action and support for that student should be considered. The list should also be sent to the faculty's student support team in order to facilitate the coordination of intervention with at-risk students. Currently a manual process is required to achieve this, however further development would be required to automate this process.

### **8.6.5 Summary of Recommendations for Future Versions or Adaptation of the Surveys**

The research that has been undertaken for this PhD thesis has highlighted a number of topics on which further research would be beneficial.

- More combination of positive and negative phrased questions could have been included to avoid the acquiescence response style from the respondents. An attempt was made to remove the response bias by including questions with a combination of positive and negative phrased measuring items. However, since there were not many, we include this as a limitation.
- Improving the design of the online survey by adding options such as not applicable; none of the above; and/or open questions requesting clarifications.
- Considering the nature of the survey more time should have been spent initially on a qualitative investigation of the issues with students prior to survey construction.
- Considering future research questions worth investigating:
  - The impact of increasing awareness of the early alert tools such as MEAP on students.
  - The impact of 'increase in issues with the teaching staff' on student academic performance.
  - The reasons for a mismatch between student expectations and needs as a redirection to and utilisation of campus support services or satisfaction with the tool.

## 8.7 Closing Remarks

At the start of this PhD project, we envisioned the creation of a student engagement and academic success (SEAS) framework that can be operationalised via supporting information system/s and associated institutional processes to suggest timely intervention to students ‘at-risk’. To achieve this, we proposed an eclectic theoretical framework to conceptualise the use of learning analytics to assist teachers to analyse and act upon student data.

Thus, in this thesis, empirical data on the perceptions and experiences of students and teachers towards early alerts systems were collected using an actual early alert system (MEAP+) explored in a real world context, that is, with students and teachers as they undertake units of study at our institution. Understanding both students’ and teachers’ perceptions of the early alert process was important for us to move forward to meet the bigger goals of this thesis i.e., to identify students at risk, understanding why they are at risk, designing interventions accordingly to reduce that risk, and finally closing the loop by tracking the effectiveness of the applied intervention(s).

The positive attitudes of students and teachers to the concept of early alerts, provided encouragement to develop a flexible and generalisable conceptual SEAS framework that allow: (1) integration of data stored in different HEI systems and use of learning analytics (machine learning or information visualisation) to identify at-risk students proactively; and (2) accommodate the variety in learning contexts across different units/subjects.

This thesis provides a starting point for understanding how students and teachers view early alerts. It also helps to inform administrators, educational leaders and program directors about effective areas of improvement to early alert process, support and interventions based on the student and teacher perspectives. Further research is needed on multiple institutions and into larger and more diverse student populations to widen the understanding and impact of a student early alert system on student performance, retention rates or graduation rates. We hope our proposed conceptual SEAS framework and the results of both student and teacher perspective study provide a foundation for institutions considering the development and

implementation of early alert systems, such as Macquarie University's utilisation of MEAP+.

## REFERENCES

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- ABDOUS, M., WU, H. & YEN, C. 2012. 'Using data mining for predicting relationships between online question theme and final grade'. *Educational Technology & Society*, vol. 15, no.3, pp. 77-88.
- ACHILLES, W., BYRD, K., STRAUSS, J., FRANKLIN, P. & JANOWICH, J. 2011. 'Engaging students through communication and contact: Outreach can positively impact your students and you'. *Journal of Online Learning and Teaching*, vol. 7, no.1, pp. 128-133.
- ADEJO, O. & CONNOLLY, T. 2017. 'Learning analytics in a shared-network educational environment: Ethical issues and countermeasures'. *Learning*, vol. 8, no.4.
- AGNIHOTRI, L. & OTT, A. 2014. Building a student at-risk model: An end-to-end perspective from user to data scientist. *Educational Data Mining*. London, UK.
- AGUDO-PEREGRINA, A., IGLESIAS-PRADAS, S., CONDE-GONZALEZ, M. & HERNANDEZ-GARCIA, A. 2014. 'Can we predict success from log data in vles? Classification of interactions for learning analytics and their relation with performance in VLE-supported F2F and online learning'. *Computers in Human Behavior*, vol. 31, pp. 542-550.
- AINLEY, M. 2012. Students' interest and engagement in classroom activities. *Handbook of Research on Student Engagement*. Springer.
- ALARCON, G. & EDWARDS, J. 2013. 'Ability and motivation: Assessing individual factors that contribute to university retention'. *Journal of Educational Psychology*, vol. 105, no.1, p. 129.
- ALDUNATE, R. & NUSSBAUM, M. 2013. 'Teacher adoption of technology'. *Computers in Human Behavior*, vol. 29, no.3, pp. 519-524.
- ALHAJRAF, N. & ALASFOUR, A. 2014. 'The impact of demographic and academic characteristics on academic performance'. *International Business Research*, vol. 7, no.4, p. 92.
- AMERICAN ASSOCIATION OF STATE COLLEGES AND UNIVERSITIES 2005. Student success in state colleges and universities: A matter of culture and leadership. Washington, DC: American Association of State Colleges and Universities.
- AN, B. P. 2015. 'The role of academic motivation and engagement on the relationship between dual enrollment and academic performance'. *The Journal of Higher Education*, vol. 86, no.1, pp. 98-126.
- ARMSTRONG, J. S. & OVERTON, T. S. 1977. 'Estimating nonresponse bias in mail surveys'. *Journal of marketing research*, vol., pp. 396-402.
- ARNOLD, K. & PISTILLI, M. 2012. Course signals at purdue: Using learning analytics to increase student success. *Learning Analytics and Knowledge*. ACM.

- ARNOLD, K. E. 2010. 'Signals: Applying academic analytics'. *Educause Quarterly*, vol. 33, no.1, p. n1.
- ARNOLD, K. E., LYNCH, G., HUSTON, D., WONG, L., JORN, L. & OLSEN, C. W. Building institutional capacities and competencies for systemic learning analytics initiatives. Proceedings of the Fourth International Conference on Learning Analytics And Knowledge. ACM.
- ASARTA, C. J. & SCHMIDT, J. R. 2017. 'Comparing student performance in blended and traditional courses: Does prior academic achievement matter?'. *The Internet and Higher Education*, vol. 32, pp. 29-38.
- ASBY, S. 2015. *Early alert and intervention systems and student persistence: An exploration of student perceptions*. Doctoral Dissertation.
- ASTIN, A. 1985. *Achieving educational excellence: A critical assessment of priorities and practices in higher education*, Jossey-Bass San Francisco.
- ASTIN, A. 1993. *What matters in college: Four critical years revisited*, Jossey-Bass San Francisco.
- ATIF, A., BILGIN, A. & RICHARDS, D. 2015. Student preferences and attitudes to the use of early alerts. *Americas Conference on Information Systems*. Atlanta, Georgia.
- ATIF, A., RICHARDS, D. & BILGIN, A. 2013. A student retention model: Empirical, theoretical and pragmatic considerations. *Australasian Conference on Information Systems*. Melbourne.
- ATIF, A., RICHARDS, D., BILGIN, A. & MARRONE, M. 2013. Learning analytics in higher education: A summary of tools and approaches. In: CARTER, H., GOSPER, M. & HEDBERG, J. (Eds.) *Electric Dreams, ASCILITE*. Sydney.
- AVELLA, J. T., KEBRITCHI, M., NUNN, S. G. & KANAI, T. 2016. 'Learning analytics methods, benefits, and challenges in higher education: A systematic literature review'. *Online Learning*, vol. 20, no.2, pp. 13-29.
- BAILEY, L., DAY, C., DAY, T., GRIFFIN, A., HOWLETT, P., KANE, M., KIRK, C., MCCULLOUGH, N., MCKIERNAN, B. & MCMULLEN, T. 2004. Using ICT in schools: Addressing teacher workload issues. Available: <http://webarchive.nationalarchives.gov.uk/20130401151715/http://www.education.gov.uk/publications/eOrderingDownload/RR595.pdf> [Accessed June 6 2013].
- BAILEY, M., IFENTHALER, D., GOSPER, M. & KRETZSCHMAR, M. 2014. Factors influencing tertiary students' choice of study mode. *ASCILITE*. Dunedin, NZ.
- BAKER, B. M. 2007. *A conceptual framework for making knowledge actionable through capital formation*. University of Maryland University College.
- BAKER, R. & INVENTADO, P. 2014. *Educational data mining and learning analytics*, New York, Springer.
- BAKER, R. & YACEF, K. 2009. 'The state of educational data mining in 2009: A review and future visions'. *Journal of Educational Data Mining*, vol. 1, no.1, pp. 3-17.

- BANDURA, A. 1993. 'Perceived self-efficacy in cognitive development and functioning'. *Educational psychologist*, vol. 28, no.2, pp. 117-148.
- BARBER, R. & SHARKEY, M. 2012. Course correction: Using analytics to predict course success. *Learning Analytics and Knowledge*. ACM.
- BAREFOOT, B. O., GRIFFIN, B. Q. & KOCH, A. K. 2012. 'Enhancing student success and retention throughout undergraduate education: A national survey'. *Gardner Institute for Excellence in Undergraduate Education*, vol.
- BARON, P. & CORBIN, L. 2012. 'Student engagement: Rhetoric and reality'. *Higher Education Research & Development*, vol. 31, no.6, pp. 759-772.
- BARWICK, H. 2014. UWS uses data analysis to track student performance. Available: <http://www.computerworld.com.au/article/555606/uws-uses-data-analysis-track-student-performance/> [Accessed August 19 2014].
- BAZELEY, P. 2009. 'Editorial: Integrating data analyses in mixed methods research'. *Journal of Mixed Methods Research*, vol. 3, no.3, pp. 203-207.
- BEAN, J. 1980. 'Dropouts and turnover: The synthesis and test of a causal model of student attrition'. *Research in Higher Education*, vol. 12, no.2, pp. 155-187.
- BEER, C., CLARK, K. & JONES, D. 2010. Indicators of engagement. *ASCILITE*. Sydney.
- BEER, C., TICKNER, R. & JONES, D. 2014. Three paths for learning analytics and beyond: Moving from rhetoric to reality. *ASCILITE*. Sydney.
- BERGMAN, M. 2008. *Advances in mixed methods research: Theories and applications*, SAGE Publications Inc.
- BERNARD, R. 2012. *Social research methods: Qualitative and quantitative approaches*, SAGE Publications Inc.
- BEVITT, D., BALDWIN, C. & CALVERT, J. 2010. 'Intervening early: Attendance and performance monitoring as a trigger for first year support in the biosciences'. *Bio-Science Education*, vol. 15, no.1, pp. 1-14.
- BLACKSTONE, A. 2012. *Sociological inquiry principles: Qualitative and quantitative methods*, Maine: Flat World Knowledge.
- BLAND, M. & ALTMAN, D. 1997. 'Statistics notes: Cronbach's alpha'. *British Medical Journal*, vol. 314, no.7, pp. 572-576.
- BOGARD, M. 2011. Empirical methods for predicting student retention-a summary from the literature. *Economics Faculty Publications* [Online]. Available: [http://digitalcommons.wku.edu/econ\\_fac\\_pub/9/](http://digitalcommons.wku.edu/econ_fac_pub/9/) [Accessed September 2, 2013].
- BOLARINWA, O. 2015. 'Principles and methods of validity and reliability testing of questionnaires used in social and health science researches'. *Nigerian Postgraduate Medical Journal*, vol. 22, no.4, pp. 195-215.
- BOYATZIS, R. 1998. *Transforming qualitative information: Thematic analysis and code development*, SAGE Publications Inc.

- BRADLEY, A. P. & BLANCO, C. 2010. Promoting a culture of student success: How colleges and universities are improving degree completion. *Southern Regional Education Board*.
- BRAR, I. K., RYU, J. E., SHAIKH, K., ALTMAN, A. & NG, J. 2012. 'University campus peer support centres: Benefits for student emotional and mental well-being'. *The Meducator*, vol. 1, no.21, pp. 15-18.
- BRAUN, V. & CLARKE, V. 2006. 'Using thematic analysis in psychology'. *Qualitative research in psychology*, vol. 3, no.2, pp. 77-101.
- BRICKNALL, R., IAROSSE, D. & GRISDALE, J. 2017. Graduate outcomes survey methodological report Melbourne, VIC: The Australian Government Department of Education and Training.
- BRITTO, M. & RUSH, S. 2013. 'Developing and implementing comprehensive student support services for online students'. *Journal of Asynchronous Learning Networks*, vol. 17, no.1, pp. 29-42.
- BROWN, C. & EVAGELISTIS, Y. 2011. Flag and follow: A whole of institution approach to early identification and intervention for students potentially at risk. *First Year in Higher Education Conference*. Brisbane, Australia.
- BROWN, N., KREGAR, G. & WILLIAMS, G. 2013. Technology enhanced learning and teaching *TELT White Paper* [Online]. Available: [http://www.teaching-learning.utas.edu.au/\\_\\_data/assets/pdf\\_file/0020/439013/Technology-Enhanced-Learning-and-Teaching-White-Paper-Academic-Senate-15-November-2013.pdf](http://www.teaching-learning.utas.edu.au/__data/assets/pdf_file/0020/439013/Technology-Enhanced-Learning-and-Teaching-White-Paper-Academic-Senate-15-November-2013.pdf) [Accessed December 21, 2015].
- BRUCE, M., BRIDGELAND, J., FOX, J. & BALFANZ, R. 2011. *The use of early warning indicator and intervention systems to build a grad nation*, Johns Hopkins University.
- BRYSON, C. 2016. Engagement through partnership: Students as partners in learning and teaching in higher education. Taylor & Francis.
- BUCKLEY, A. 2014. 'The UK engagement survey 2014: The second pilot year'.
- BURNS, M., APPLETON, J. & STEHOUWER, J. 2005. 'Meta-analytic review of responsiveness-to-intervention research: Examining field-based and research-implemented models'. *Journal of Psycho-educational Assessment*, vol. 23, no.4, pp. 381-394.
- BYRNE, M., FLOOD, B., HASSALL, T., JOYCE, J., MONTANO, J., MARIA, G. & GERMANOU, E. 2012. 'Motivations, expectations and preparedness for higher education: A study of accounting students in Ireland, the UK, Spain and Greece'. *Accounting Forum*, vol. 36, no.2, pp. 134-144.
- CADE, W. 2012. Basketball genomics - evaluation of performance: Evolution of the official box score. *Analytics Magazine*. Catonsville, USA: INFORMS (the Institute for Operations Research and the Management Sciences).
- CAI, Q., LEWIS, C. & HIGDON, J. 2015. 'Developing an early-alert system to promote student visits to tutor center'. *The Learning Assistance Review*, vol. 20, no.1, p. 61.

- CAMERON, R. 2009. 'A sequential mixed model research design: Design, analytical and display issues'. *International Journal of Multiple Research Approaches*, vol. 3, no.2, pp. 140-152.
- CAMPBELL, J. 2007. *Utilizing student data within the course management system to determine undergraduate student academic success: An exploratory study*. Doctoral Dissertation, Purdue University.
- CAMPBELL, J., DEBLOIS, P. & OBLINGER, D. 2007. 'Academic analytics: A new tool for a new era'. *EDUCAUSE Review*, vol. 42, no.4, p. 40.
- CAMPBELL, J. P. & OBLINGER, D. G. 2007. Academic analytics. *EDUCAUSE Publications*.
- CAMPBELL, T. A. & CAMPBELL, D. E. 2007. 'Outcomes of mentoring at-risk college students: Gender and ethnic matching effects'. *Mentoring & Tutoring*, vol. 15, no.2, pp. 135-148.
- CARDAK, B. A. & VECCI, J. 2013. 'Catholic school effectiveness in australia: A reassessment using selection on observed and unobserved variables'. *Economics of Education Review*, vol. 37, pp. 34-45.
- CAREY, J., MORGAN, M. & OXTOBY, M. 1996. 'Intercoder agreement in analysis of responses to open-ended interview questions: Examples from tuberculosis research'. *Journal of Cultural Anthropology Methods*, vol. 8, no.3, pp. 1-5.
- CAREY, K. 2005. Choosing to improve: Voices from colleges and universities with better graduation rates. Available: [http://edtrust.org/wp-content/uploads/2013/10/Choosing\\_to\\_improve.pdf](http://edtrust.org/wp-content/uploads/2013/10/Choosing_to_improve.pdf) [Accessed March 1, 2013].
- CARTY, J. The irish survey of student engagement: A comparative analysis with international surveys of student engagement. 11th Annual Tourism and Hospitality Research in Ireland Conference (THRIC).
- CARUSO, J. 2006. 'Measuring student experiences with course management systems'. *EDUCAUSE Research Bulletin*, vol. 2006, no.19, pp. 1-12.
- CHATTI, A., DYCKHOFF, L., SCHROEDER, U. & THUS, H. 2012. 'A reference model for learning analytics'. *International Journal of Technology Enhanced Learning*, vol. 4, no.5, pp. 318-331.
- CHEMERS, M., HU, L. & GARCIA, B. 2001. 'Academic self-efficacy and first year college student performance and adjustment'. *Journal of Educational Psychology*, vol. 93, no.1, p. 55.
- CHUNG, K. S. K. & PAREDES, W. C. 2015. 'Towards a social networks model for online learning & performance'. *Journal of Educational Technology & Society*, vol. 18, no.3, p. 240.
- CHURCHILL, W. & IWAI, S. 1981. 'College attrition, student use of campus facilities, and a consideration of self-reported personal problems'. *Research in Higher Education*, vol. 14, no.4, pp. 353-365.
- CLOW, D. The learning analytics cycle: Closing the loop effectively. Proceedings of the 2nd international conference on learning analytics and knowledge. ACM.

- CLOW, D. 2013. 'An overview of learning analytics'. *Teaching in Higher Education*, vol. 18, no.6, pp. 683-695.
- COATES, H. 2010a. 'Development of the australasian survey of student engagement (ausse)'. *Higher Education*, vol. 60, no.1, pp. 1-17.
- COATES, H. 2010b. 'Getting first-year students engaged'.
- COATES, H. 2011. 'An overview of psychometric properties of the ausse student engagement questionnaire (seq)'.
- COATES, H., JAMES, R. & BALDWIN, G. 2005. 'A critical examination of the effects of learning management systems on university teaching and learning'. *Tertiary Education and Management*, vol. 11, pp. 19-36.
- COCHRAN, J., CAMPBELL, S., BAKER, H. & LEEDS, E. 2014. 'The role of student characteristics in predicting retention in online courses'. *Research in Higher Education*, vol. 55, no.1, pp. 27-48.
- COHEN, J. 1968. 'Weighted kappa: Nominal scale agreement provision for scaled disagreement or partial credit'. *Psychological Bulletin*, vol. 70, no.4, p. 213.
- COHEN, L., MANION, L. & MORRISON, K. 2013. *Research methods in education*, Routledge.
- COLVIN, C., ROGERS, T., WADE, A., DAWSON, S., GAŠEVIĆ, D., BUCKINGHAM SHUM, S. & FISHER, J. 2015. 'Student retention and learning analytics: A snapshot of australian practices and a framework for advancement'. *Sydney, NSW: Australian Office for Learning and Teaching*, vol.
- CONDE, M. Á. & HERNÁNDEZ-GARCÍA, Á. 2015. 'Learning analytics for educational decision making'. *Computers in Human Behavior*, vol., no.47, pp. 1-3.
- CORRIN, L. & BARBA, P. 2014. Exploring students' interpretation of feedback delivered through learning analytics dashboards. *ASCILITE*. Dunedin, NZ.
- CORRIN, L., KENNEDY, G. & MULDER, R. 2013. Enhancing learning analytics by understanding the needs of teachers. *ASCILITE*. Sydney.
- CRESWELL, J. 2013. *Research design: Qualitative, quantitative, and mixed methods approaches*, SAGE Publications Inc.
- CRESWELL, J. & CLARK, P. 2007. Choosing a mixed methods design. *Designing and conducting mixed methods research*.
- CRONBACH, L. 1951. 'Coefficient alpha and the internal structure of tests'. *Psychometrika*, vol. 16, no.3, pp. 297-334.
- DANIEL, B. 2015. 'Big data and analytics in higher education: Opportunities and challenges'. *British Journal of Educational Technology*, vol. 46, no.5, pp. 904-920.
- DANIEL, F., PAPADOPOULOS, G. A. & THIRAN, P. 2013. *Mobile web information systems: 10th international conference, mobiwis 2013, paphos, cyprus, august 26-29, 2013, proceedings*, Springer.

- DANILOWICZ-GÖSELE, K., LERCHE, K., MEYA, J. & SCHWAGER, R. 2017. 'Determinants of students' success at university'. *Education economics*, vol. 25, no.5, pp. 513-532.
- DAWSON, S., GAŠEVIĆ, D., SIEMENS, G. & JOKSIMOVIC, S. Current state and future trends: A citation network analysis of the learning analytics field. Proceedings of the Fourth International Conference on Learning Analytics And Knowledge. ACM.
- DE FREITAS, S., GIBSON, D., DU PLESSIS, C., HALLORAN, P., WILLIAMS, E., AMBROSE, M., DUNWELL, I. & ARNAB, S. 2015. 'Foundations of dynamic learning analytics: Using university student data to increase retention'. *British Journal of Educational Technology*, vol. 46, no.6, pp. 1175-1188.
- DELEN, D. 2010. 'A comparative analysis of machine learning techniques for student retention management'. *Decision Support Systems*, vol. 49, no.4, pp. 498-506.
- DEPARTMENT OF EDUCATION AND TRAINING. 2017. Key findings from the completion rates of higher education students-cohort analysis 2005-2015 report. Available: <https://docs.education.gov.au/node/46121> [Accessed 26 August 2018].
- DEPARTMENT OF EDUCATION EMPLOYMENT AND WORKPLACE RELATIONS. 2009. An indicator framework for higher education performance funding. Available: [https://www.griffith.edu.au/\\_\\_data/assets/pdf\\_file/0005/211397/performance-funding.pdf](https://www.griffith.edu.au/__data/assets/pdf_file/0005/211397/performance-funding.pdf) [Accessed December 6, 2013].
- DEVLIN, M. Non-traditional student achievement: Theory, policy and practice in Australian higher education. FYHE 2010: Aspiration, Access, Achievement: Proceedings of the 13th Pacific Rim First Year in Higher Education Conference 2010. Queensland University of Technology.
- DIETZ-UHLER, B. & HURN, J. 2013. 'Using learning analytics to predict (and improve) student success: A faculty perspective'. *Journal of Interactive Online Learning*, vol. 12, no.1, pp. 17-26.
- DINU, V. E., PAPUC, D., GHEORGHIU, A., DASCALU, M.-I., MOLDOVEANU, A. & MOLDOVEANU, F. 2017. 'Biometric data in learning analytics: A survey on existing applications'. *eLearning & Software for Education*, vol. 2.
- DONNELLY, J. 2010. 'Use of a web-based academic alert system for identification of underachieving students at an urban research institution'. *College and University*, vol. 85, no.4, p. 39.
- DRACHSLER, H. & GRELLER, W. Privacy and analytics: It's a delicate issue a checklist for trusted learning analytics. Proceedings of the sixth international conference on learning analytics & knowledge. ACM.
- DRON, J. & ANDERSON, T. On the design of collective applications. Computational Science and Engineering, 2009. CSE'09. International Conference on. IEEE.

- DROST, E. 2011. 'Validity and reliability in social science research'. *Education Research and Perspectives*, vol. 38, no.1, p. 105.
- DUNDES, L. & MARX, J. 2006. 'Balancing work and academics in college: Why do students working 10 to 19 hours per week excel?'. *Journal of College Student Retention: Research, Theory & Practice*, vol. 8, no.1, pp. 107-120.
- DWECK, C. S., WALTON, G. M. & COHEN, G. L. 2014. 'Academic tenacity: Mindsets and skills that promote long-term learning'. *Bill & Melinda Gates Foundation*, vol.
- ELIAS, T. 2011. 'Learning analytics'. *Learning*, vol., pp. 1-22.
- ESSA, A. & AYAD, H. 2012a. 'Improving student success using predictive models and data visualisations'. *Research in Learning Technology*, vol. 20.
- ESSA, A. & AYAD, H. Student success system: Risk analytics and data visualization using ensembles of predictive models. *Learning Analytics and Knowledge*. ACM.
- FALAKMASIR, H. & HABIBI, J. Using educational data mining methods to study the impact of virtual classroom in e-learning. *Educational Data Mining*, Pittsburgh, USA.
- FELDT, L. 1965. 'The approximate sampling distribution of kuder-richardson reliability coefficient twenty'. *Psychometrika*, vol. 30, no.3, pp. 357-370.
- FERGUSON, R. 2012a. 'Learning analytics: Drivers, developments and challenges'. *International Journal of Technology Enhanced Learning*, vol. 4, no.5-6, pp. 304-317.
- FERGUSON, R. 2012b. 'The state of learning analytics in 2012: A review and future challenges'. *International Journal of Technology Enhanced Learning* vol. 4, no.5, pp. 304-317.
- FERGUSON, R., CLOW, D., MACFADYEN, L., ESSA, A., DAWSON, S. & ALEXANDER, S. Setting learning analytics in context: Overcoming the barriers to large-scale adoption. *Proceedings of the Fourth International Conference on Learning Analytics And Knowledge*. ACM.
- FLICK, U. 2009. *An introduction to qualitative research*, SAGE Publications Inc.
- FRAZELLE, S. & NAGEL, A. 2015. A practitioner's guide to implementing early warning systems. Available: [https://ies.ed.gov/ncee/edlabs/regions/northwest/pdf/REL\\_2015056.pdf](https://ies.ed.gov/ncee/edlabs/regions/northwest/pdf/REL_2015056.pdf) [Accessed March 2, 2016].
- FREDRICKS, J., BLUMENFELD, P. & PARIS, A. 2004. 'School engagement: Potential of the concept, state of the evidence'. *Review of Educational Research*, vol. 74, no.1, pp. 59-109.
- FREDRICKS, J. & MCCOLSKEY, W. 2012. *The measurement of student engagement: A comparative analysis of various methods and student self-report instruments*, Springer.

- FREEMAN, S., EDDY, S. L., MCDONOUGH, M., SMITH, M. K., OKOROAFOR, N., JORDT, H. & WENDEROTH, M. P. 2014. 'Active learning increases student performance in science, engineering, and mathematics'. *Proceedings of the National Academy of Sciences*, vol. 111, no.23, pp. 8410-8415.
- FRITZ, J. 2011. 'Classroom walls that talk: Using online course activity data of successful students to raise self-awareness of underperforming peers'. *The Internet and Higher Education*, vol. 14, no.2, pp. 89-97.
- FROISSARD, J.-C., LIU, D., RICHARDS, D. & ATIF, A. A learning analytics pilot in moodle and its impact on developing organisational capacity in a university. In: PARTRIDGE, H., DAVIS, K. & THOMAS, J., Eds. 34th International Conference on Innovation, Practice and Research in the Use of Educational Technologies in Tertiary Education, Queensland, Australia.
- FUCHS, D. & FUCHS, L. 2006. 'Introduction to response to intervention: What, why, and how valid is it?'. *Reading Research Quarterly*, vol. 41, no.1, pp. 93-99.
- FUSCH, D. 2011. Tackling the retention challenge: Defining and delivering a unique student experience. *Academic Impressions* [Online]. Available: <https://www.academicimpressions.com/sites/default/files/0411-diagnostic.pdf> [Accessed June 5, 2013].
- GASEVIC, D., DAWSON, S. & JOVANOVIĆ, J. 2016. 'Ethics and privacy as enablers of learning analytics'. *Journal of learning Analytics*, vol. 3, no.1, pp. 1-4.
- GAŠEVIĆ, D., DAWSON, S., ROGERS, T. & GASEVIC, D. 2016. 'Learning analytics should not promote one size fits all: The effects of instructional conditions in predicting academic success'. *The Internet and Higher Education*, vol. 28, pp. 68-84.
- GAŠEVIĆ, D., DAWSON, S. & SIEMENS, G. 2015. 'Let's not forget: Learning analytics are about learning'. *TechTrends*, vol. 59, no.1, pp. 64-71.
- GASEVIS, D., DAWSON, S. & SIEMENS, G. 2015. 'Let's not forget: Learning analytics are about learning'. *TechTrends*, vol. 59, no.1, pp. 64-71.
- GILBOY, M. B., HEINERICH, S. & PAZZAGLIA, G. 2015. 'Enhancing student engagement using the flipped classroom'. *Journal of nutrition education and behavior*, vol. 47, no.1, pp. 109-114.
- GILLING, J. 2010. 'A sense of belonging'. *Campus Review*, vol. 21, no.14.
- GOLDSTEIN, P. & KATZ, R. 2005. Academic analytics: The uses of management information and technology in higher education: Educause.
- GRELLER, W. & DRACHSLER, H. 2012. 'Translating learning into numbers: A generic framework for learning analytics'. *Journal of Educational Technology & Society*, vol. 15, no.3, pp. 42-57.
- GUNUC, S. 2014. 'The relationship between student engagement and their academic achievement'. *International Journal on New Trends in Education and Their Implications*, vol. 5, no.4, pp. 216-231.

- GUNUC, S. & KUZU, A. 2015. 'Student engagement scale: Development, reliability and validity'. *Assessment & Evaluation in Higher Education*, vol. 40, no.4, pp. 587-610.
- GURSOY, M. E., INAN, A., NERGIZ, M. E. & SAYGIN, Y. 2017. 'Privacy-preserving learning analytics: Challenges and techniques'. *IEEE Transactions on Learning technologies*, vol. 10, no.1, pp. 68-81.
- HABLEY, W., VALIGA, M., MCCLANAHAN, R. & BURKUM, K. 2010. What works in student retention: Fourth national survey (report of all colleges and universities). *ACT News* [Online]. Available: <http://www.act.org/content/dam/act/unsecured/documents/Retention-AllInstitutions.pdf> [Accessed March 1, 2013].
- HATTIE, J. & TIMPERLEY, H. 2007. 'The power of feedback'. *Review of educational research*, vol. 77, no.1, pp. 81-112.
- HAWKINS, B. L. 2008. 'Accountability, demands for information, and the role of the campus it organization'. *The tower and the cloud*, vol., p. 98.
- HEALE, R. & TWYLCROSS, A. 2015. 'Validity and reliability in quantitative studies'. *Evidence Based Nursing*, vol. 18, no.3, pp. 66-67.
- HENDRICKS, M., PLANTZ, M. C. & PRITCHARD, K. J. 2008. 'Measuring outcomes of united way-funded programs: Expectations and reality'. *New Directions for Evaluation*, vol. 2008, no.119, pp. 13-35.
- HERODOTOU, C., RIENTIES, B., BOROOVA, A., ZDRAHAL, Z., HLOSTA, M. & NAYDENOVA, G. 2017. Implementing predictive learning analytics on a large scale: The teacher's perspective. *Learning Analytics & Knowledge Conference*. Vancouver, Canada.
- HORST, P. 1953. 'Correcting the kuder-richardson reliability for dispersion of item difficulties'. *Psychological Bulletin*, vol. 50, no.5, p. 371.
- HOWE, K. 1988. 'Against the quantitative-qualitative incompatibility thesis or dogmas die hard'. *Educational Researcher*, vol. 17, no.8, pp. 10-16.
- HUNG, J.-L., HSU, Y.-C. & RICE, K. 2012. 'Integrating data mining in program evaluation of k-12 online education'. *Journal of Educational Technology & Society*, vol. 15, no.3.
- IFENTHALER, D. 2017. 'Are higher education institutions prepared for learning analytics?'. *TechTrends*, vol. 61, no.4, pp. 366-371.
- IFENTHALER, D. & TRACEY, M. W. 2016. 'Exploring the relationship of ethics and privacy in learning analytics and design: Implications for the field of educational technology'. *Educational Technology Research and Development*, vol. 64, no.5, pp. 877-880.
- ISA, R. & AZERO, M. 2013. 'Assessment feedback to accounting students'. *Social and Behavioral Sciences*, vol. 90, pp. 651-659.
- IVANKOVA, N., CRESWELL, J. & STICK, S. 2006. 'Using mixed-methods sequential explanatory design: From theory to practice'. *Field Methods*, vol. 18, no.1, pp. 3-20.

- JACKSON, G. & READ, M. 2012. Connect 4 success: A proactive student identification and support program. Available: [http://fyhe.com.au/past\\_papers/papers12/Papers/9B.pdf](http://fyhe.com.au/past_papers/papers12/Papers/9B.pdf) [Accessed March 14, 2013].
- JAYAPRAKASH, S., MOODY, E., LAURÍA, E., REGAN, J. & BARON, J. 2014. 'Early alert of academically at-risk students: An open source analytics initiative'. *Journal of Learning Analytics*, vol. 1, no.1, pp. 6-47.
- JOHNSON, L., BECKER, S. & HALL, C. 2015. 2015 nmc technology outlook for australian tertiary education: A horizon project regional report. Available: <http://cdn.nmc.org/media/2015-nmc-technology-outlook-australian-tertiary-education.pdf> [Accessed February 19, 2016].
- JONES, D. & CLARK, D. Breaking bad to bridge the reality/rhetoric chasm. ASCILITE, Dunedin, NZ.
- JONES, D., PIKE, L., COHEN, L., YOUNG, A., HAUNOLD, S. & DREW, N. 2003. 'Are they being served? Student expectations of higher education'. . *Issues in Educational Resea*, vol. 13, no.1, pp. 31-52.
- JONES, H. Ethical considerations in the use of student data: International perspectives and educators' perceptions. ASCILITE, Adelaide.
- KAHU, E. 2013. 'Framing student engagement in higher education'. *Studies in Higher Education*, vol. 38, no.5, pp. 758-773.
- KANDIKO, C. & MAWER, M. 2013. 'Student expectations and perceptions of higher education'. *London: King's Learning Institute*, vol.
- KANGETHE, M. & MUHURO, P. 2014. 'Exploring the importance of early alert programs in improving learning in selected public universities in south africa'. *Mediterranean Journal of Social Sciences*, vol. 5, no.23, p. 1099.
- KE, F. & KWAK, D. 2013. 'Online learning across ethnicity and age: A study on learning interaction participation, perception, and learning satisfaction'. *Computers & Education*, vol. 61, pp. 43-51.
- KENNEDY, G., CORRIN, L., LOCKYER, L., DAWSON, S., WILLIAMS, D., MULDER, R., KHAMIS, S. & COPELAND, S. Completing the loop: Returning learning analytics to teachers. ASCILITE, Dunedin, NZ.
- KING, N. & HORROCKS, C. 2010. *Interviews in qualitative research*, SAGE Publications Inc.
- KINNEAR, A., BOYCE, M., SPARROW, H., MIDDLETON, S. & CULLITY, M. 2008. Diversity: A longitudinal study of how student diversity relates to resilience and successful progression in a new generation university. Available: <http://ro.ecu.edu.au/cgi/viewcontent.cgi?article=8052&context=ecuworks> [Accessed March 11, 2013].
- KINNEAR, A., BOYCE, M., SPARROW, H., MIDDLETON, S. & CULLITY, M. 2009. Diversity: A longitudinal study of how student diversity relates to resilience and successful progression in a new generation university. Sydney: Australian Learning and Teaching Council. [www. altc. edu. au/system/files/resources/CG6-38\\_ECU\\_ Kinnear\\_Final%20Report\\_Apr09. pdf](http://www.altc.edu.au/system/files/resources/CG6-38_ECU_Kinnear_Final%20Report_Apr09.pdf) (accessed August 7, 2010).

- KIRK, J. & MILLER, M. 1986. *Reliability and validity in qualitative research*, SAGE Publications Inc.
- KNIGHT, S., SHUM, S. B. & LITTLETON, K. 2014. 'Epistemology, assessment, pedagogy: Where learning meets analytics in the middle space'. *Journal of Learning Analytics*, vol. 1, no.2, pp. 23-47.
- KOENIG, A. & HAUSER, R. 2011. *High school dropout, graduation, and completion rates:: Better data, better measures, better decisions*, National Academies Press.
- KOVANOVIĆ, V., GAŠEVIĆ, D., JOKSIMOVIĆ, S., HATALA, M. & ADESOPE, O. 2015. 'Analytics of communities of inquiry: Effects of learning technology use on cognitive presence in asynchronous online discussions'. *The Internet and Higher Education*, vol. 27, pp. 74-89.
- KRAUSE, K. & COATES, H. 2008. 'Students' engagement in first-year university'. *Assessment & Evaluation in Higher Education*, vol. 33, no.5, pp. 493-505.
- KRIPPENDORFF, K. 1980. *Content analysis*, SAGE Publications Inc.
- KUDER, F. & RICHARDSON, M. 1937. 'The theory of the estimation of test reliability'. *Psychometrika*, vol. 2, no.3, pp. 151-160.
- KUH, G. 2008. Excerpt from high-impact educational practices: What they are, who has access to them, and why they matter. *Association of American Colleges and Universities* [Online]. Available: [https://keycenter.unca.edu/sites/default/files/aacu\\_high\\_impact\\_2008\\_final.pdf](https://keycenter.unca.edu/sites/default/files/aacu_high_impact_2008_final.pdf) [Accessed March 11, 2013].
- KUH, G., CRUCE, T., SHOUP, R., KINZIE, J. & GONYEA, R. 2008. 'Unmasking the effects of student engagement on first-year college grades and persistence'. *The Journal of Higher Education*, vol. 79, no.5, pp. 540-563.
- KUH, G., KINZIE, J., BUCKLEY, J., BRIDGES, B. & HAYEK, J. 2011. *Piecing together the student success puzzle: Research, propositions, and recommendations*, John Wiley & Sons.
- KUH, G., KINZIE, J., SCHUH, J. & WHITT, E. 2005. 'Never let it rest lessons about student success from high-performing colleges and universities'. *Change: The Magazine of Higher Learning*, vol. 37, no.4, pp. 44-51.
- KUH, G., LAIRD, N. & UMBACH, P. 2004. 'Aligning faculty activities & student behavior: Realizing the promise of greater expectations'. *Liberal Education*, vol. 90, no.4, pp. 24-31.
- KUH, G. D. 2009. 'The national survey of student engagement: Conceptual and empirical foundations'. *New directions for institutional research*, vol. 2009, no.141, pp. 5-20.
- KUZILEK, J., HLOSTA, M., HERRMANNOVA, D., ZDRAHAL, Z., VACLAVEK, J. & WOLFF, A. 2015. Ou analyse: Analysing at-risk students at the open university. *Learning Analytics Review*. Learning Analytics Community Exchange.
- KYUNG, H. & IM, T. 2013. 'Factors of learner-instructor interaction which predict perceived learning outcomes in online learning environment'. *Journal of Computer Assisted Learning*, vol. 29, no.3, pp. 292-301.

- LAMBERT, A. D., ROCCONI, L. M., RIBERA, A. K., MILLER, A. L. & DONG, Y. Faculty lend a helping hand to student success: Measuring student-faculty interactions. Association for Institutional Research 2012 Annual Conference. Recuperado de <http://cpr.iub.edu/uploads/Faculty%20Lend%20a%20Helping%20Hand%20to%20Student%20Success%20Measuring%20Student-Faculty%20Interactions.pdf>.
- LASKEY, M. L. & HETZEL, C. J. 2011. 'Investigating factors related to retention of at-risk college students'. *Learning Assistance Review*, vol. 16, no.1, pp. 31-43.
- LAU, L. 2003. 'Institutional factors affecting student retention'. *Academic Journal*, vol. 124, no.1, pp. 126-136.
- LAVRAKAS, P. 2008. *Encyclopedia of survey research methods*, SAGE Publications Inc.
- LAWSON, C., BEER, C., ROSSI, D., MOORE, T. & FLEMING, J. 2016. 'Identification of 'at risk'students using learning analytics: The ethical dilemmas of intervention strategies in a higher education institution'. *Educational Technology Research and Development*, vol. 64, no.5, pp. 957-968.
- LEECE, R. & HALE, R. 2009. Student engagement and retention through emotional intelligence. 9. Available: [https://wiki.mq.edu.au/download/attachments/98173671/Leece\\_E-Motion.pdf?version=1&modificationDate=1350370191000](https://wiki.mq.edu.au/download/attachments/98173671/Leece_E-Motion.pdf?version=1&modificationDate=1350370191000). [Accessed April 17, 2013].
- LEECH, N. & ONWUEGBUZIE, A. 2009. 'A typology of mixed methods research designs'. *Quality & Quantity*, vol. 43, no.2, pp. 265-275.
- LEVITZ, R. & NOEL, L. 2000. The earth-shaking, but quiet revolution, in retention management. 6. Available: <https://www.ruffalonl.com/papers-research-higher-education-fundraising/2014/white-paper-earth-shaking-quiet-revolution-retention-management> [Accessed April 11, 2013].
- LEW, M. D., ALWIS, W. & SCHMIDT, H. G. 2010. 'Accuracy of students' self-assessment and their beliefs about its utility'. *Assessment & Evaluation in Higher Education*, vol. 35, no.2, pp. 135-156.
- LI, I. & DOCKERY, A. M. 2015. 'Does school socio-economic status influence university outcomes?'. *Australian Journal of Labour Economics*, vol. 18, no.1, pp. 75-94.
- LINCOLN, Y. & GUBA, E. 1985. *Naturalistic inquiry*, SAGE Publications Inc.
- LIU, D., BRIDGEMAN, A. & TAYLOR, C. 2014. 'A simple web-based analytics system to efficiently capture, analyse, and respond to student engagement and achievement'. *Higher Education*, vol. 1, pp. 1-20.
- LIU, D., FROISSARD, C., RICHARDS, D. & ATIF, A. 2015a. An enhanced learning analytics plugin for moodle: Student engagement and personalised intervention. *ASCILITE*. Perth, Western Australia.

- LIU, D., FROISSARD, C., RICHARDS, D. & ATIF, A. 2015b. Validating the effectiveness of the moodle engagement analytics plugin to predict student academic performance. *Americas Conference on Information Systems*. Atlanta, Georgia.
- LIU, D., RICHARDS, D., DAWSON, P., FROISSARD, C. & ATIF, A. 2016. Knowledge acquisition for learning analytics: Comparing teacher-derived, algorithm-derived, and hybrid models in the moodle engagement analytics plugin. In: OHWADA, H. & YOSHIDA, K. (Eds.) *Pacific Rim Knowledge Acquisition Workshop*. Phuket, Thailand: Springer International Publishing.
- LOBO, A. 2012. 'Will we meet again?: Examining the reasons why students are leaving first year university courses and moving towards an approach to stop them'. *International Journal of Learning*, vol. 18, no.7.
- LOBO, A. & MATAS, P. 2011. 'Towards the development of a prognostic approach to student retention in foreign language classes'. *The International Journal of Learning*, vol. 17, no.11, pp. 305-316.
- LOCKYER, L., HEATHCOTE, E. & DAWSON, S. 2013. 'Informing pedagogical action: Aligning learning analytics with learning design'. *American Behavioral Scientist*, vol., p. 0002764213479367.
- LOWE, H. & COOK, A. 2003. 'Mind the gap: Are students prepared for higher education?'. *Journal of Further and Higher Education*, vol. 27, no.1, pp. 53-76.
- LOWES, S., LIN, P. & KINGHORN, B. 2015. 'Exploring the link between online behaviours and course performance in asynchronous online high school courses'. *Journal of Learning Analytics*, vol. 2, no.2, pp. 169-194.
- LU, O. H., HUANG, J. C., HUANG, A. Y. & YANG, S. J. 2017. 'Applying learning analytics for improving students engagement and learning outcomes in an moocs enabled collaborative programming course'. *Interactive Learning Environments*, vol. 25, no.2, pp. 220-234.
- LYNCH-HOLMES, K., TROY, A. & RAMOS, I. 2012. Early alert & intervention: Top practices for intervention. *White Paper* [Online]. Available: [https://issuu.com/connectedu/docs/early\\_alert\\_white\\_paper](https://issuu.com/connectedu/docs/early_alert_white_paper) [Accessed April 11, 2016].
- MACFADYEN, L. & DAWSON, S. 2010. 'Mining lms data to develop an “early warning system” for educators: A proof of concept'. *Computers & Education*, vol. 54, no.2, pp. 588-599.
- MACFADYEN, L. P. & DAWSON, S. 2012. 'Numbers are not enough. Why e-learning analytics failed to inform an institutional strategic plan'. *Educational Technology & Society*, vol. 15, no.3, pp. 149-163.
- MACKAY, F. 2013. Learning analytics at stanford takes huge leap forward with moocs. Available: <http://news.stanford.edu/news/2013/april/online-learning-analytics-041113.html> [Accessed September 12, 2013].
- MACQUARIE UNIVERSITY. 2015. Annual report. 1. Available: [https://www.mq.edu.au/\\_\\_data/assets/pdf\\_file/0009/184509/Macquarie-University-Annual-Report-2015-Volume-1.pdf](https://www.mq.edu.au/__data/assets/pdf_file/0009/184509/Macquarie-University-Annual-Report-2015-Volume-1.pdf) [Accessed August 28, 2016].

- MAH, D.-K. 2016. 'Learning analytics and digital badges: Potential impact on student retention in higher education'. *Technology, Knowledge and Learning*, vol. 21, no.3, pp. 285-305.
- MAHER, M. & MACALLISTER, H. 2013. 'Retention and attrition of students in higher education: Challenges in modern times to what works'. *Higher Education Studies*, vol. 3, no.2, p. 62.
- MARGINSON, S. 2013. Tertiary education policy in australia. *Centre for the Study of Higher Education, University of Melbourne* [Online]. Available: [http://melbourne-cshe.unimelb.edu.au/\\_\\_data/assets/pdf\\_file/0007/1489174/Tert\\_Edu\\_Policy\\_Aus.pdf](http://melbourne-cshe.unimelb.edu.au/__data/assets/pdf_file/0007/1489174/Tert_Edu_Policy_Aus.pdf) [Accessed September 12 2017].
- MARJORIBANKS, K. 2003. 'Learning environments, family contexts, educational aspirations and attainment: A moderation-mediation model extended'. *Learning Environments Research*, vol. 6, no.3, pp. 247-265.
- MARKS, G. 2007. Completing university: Characteristics and outcomes of completing and non completing students. *LSAY Research Reports* [Online]. Available: [http://research.acer.edu.au/lsay\\_research/55](http://research.acer.edu.au/lsay_research/55) [Accessed September 12, 2013].
- MASELENO, A., SABANI, N., HUDA, M., AHMAD, R., JASMI, K. A. & BASIRON, B. 2018. 'Demystifying learning analytics in personalised learning'. *IACSIT International Journal of Engineering and Technology*, vol. 7, no.3, pp. 1124-1129.
- MAXWELL, J. 1992. 'Understanding and validity in qualitative research'. *Harvard Educational Review*, vol. 62, no.3, pp. 279-301.
- MCCARRON, P. & INKELAS, K. 2006. 'The gap between educational aspirations and attainment for first-generation college students and the role of parental involvement'. *Journal of College Student Development*, vol. 47, no.5, pp. 534-549.
- MCINNIS, C., JAMES, R. & HARTLEY, R. 2000. *Trends in the first year experience: In australian universities*, Canberra, Department of Education, Training and Youth Affairs
- MCINNIS, C., JAMES, R. & MCNAUGHT, C. 1995. *First year on campus: Diversity in the initial experiences of australian undergraduates*, University of Melbourne, Centre for the Study of Higher Education.
- MILES, M., HUBERMAN, M. & SALDANA, J. 2013. *Qualitative data analysis*, SAGE Publications Inc.
- MILLER, A. & MURRAY, C. 2005. *Advising academically underprepared students*, NACADA Clearinghouse of Academic Advising Resources.
- MINAEI-BIDGOLI, B., KASHY, D., KORTEMEYER, G. & PUNCH, W. Predicting student performance: An application of data mining methods with an educational web-based system. *Frontiers in Education*. IEEE.
- MONEY, J., NIXON, S., TRACY, F., HENNESSY, C., BALL, E. & DINNING, T. 2017. 'Undergraduate student expectations of university in the united kingdom: What really matters to them?'. *Cogent Education*, vol. 4, no.1, p. 1301855.

- MONROY, C., RANGEL, V. S. & WHITAKER, R. 2014. 'A strategy for incorporating learning analytics into the design and evaluation of a k-12 science curriculum'. *Journal of Learning Analytics*, vol. 1, no.2, pp. 94-125.
- MOODLE 2014. *Moodle statistics*.
- MOR, Y., FERGUSON, R. & WASSON, B. 2015. 'Learning design, teacher inquiry into student learning and learning analytics: A call for action'. *British Journal of Educational Technology*, vol. 46, no.2, pp. 221-229.
- MORGAN, D. 1998. 'Practical strategies for combining qualitative and quantitative methods: Applications to health research'. *Qualitative Health Research*, vol. 8, no.3, pp. 362-376.
- MORROW, J. & ACKERMANN, M. 2012. 'Intention to persist and retention of first-year students: The importance of motivation and sense of belonging'. *College Student Journal*, vol. 46, no.3, pp. 483-491.
- MORSE, J. 2003. *Principles of mixed methods and multimethod research design*, SAGE Publication Inc.
- MUSHTAQ, S. 2012. 'Factors affecting students' academic performance'. *Global Journal of Management and Business Research*, vol. 12, no.9.
- MYERS, K. & OETZEL, J. 2003. 'Exploring the dimensions of organizational assimilation: Creating and validating a measure'. *Communication Quarterly*, vol. 51, no.4, pp. 438-457.
- NATIONAL SURVEY OF STUDENT ENGAGEMENT. 2013. A fresh look at student engagement - annual results 2013. Available: [http://nsse.indiana.edu/NSSE\\_2013\\_Results/pdf/NSSE\\_2013\\_Annual\\_Results.pdf](http://nsse.indiana.edu/NSSE_2013_Results/pdf/NSSE_2013_Annual_Results.pdf) [Accessed February 2, 2014].
- NEDERHOF, A. 1985. 'Methods of coping with social desirability bias: A review'. *European Journal of Social Psychology*, vol. 15, no.3, pp. 263-280.
- NELSON, K. 2014. 'The first year in higher education-where to from here?'. *The International Journal of the First Year in Higher Education*, vol. 5, no.2, p. 1.
- NEWMAN, I. 2008. *Mixed methods research: Exploring the interactive continuum*, SIU Press.
- NUNALLY, J. & BERNSTEIN, I. 1978. *Psychometric theory*. New York: McGraw-Hill.
- OLSEN, A., Spain, J. & WRIGHT, R. Staying the course: Retention and attrition in Australian universities. Paper for the Australian Universities International Directors' Forum.
- ONWUEGBUZIE, A. 2000. Expanding the framework of internal and external validity in quantitative research. Available: <https://eric.ed.gov/?id=ED448205> [Accessed September 12, 2013].
- PAJARES, F. 1996. 'Self-efficacy beliefs in academic settings'. *Review of Educational Research*, vol. 66, no.4, pp. 543-578.

- PAPAMITSIOU, Z. & ECONOMIDES, A. 2014. 'Learning analytics and educational data mining in practice: A systematic literature review of empirical evidence'. *Educational Technology & Society*, vol. 17, no.4, pp. 49-64.
- PARDO, A. & SIEMENS, G. 2014. 'Ethical and privacy principles for learning analytics'. *British Journal of Educational Technology*, vol. 45, no.3, pp. 438-450.
- PASCARELLA, E. & TERENCEZINI, P. 1983. 'Predicting voluntary freshman year persistence/withdrawal behavior in a residential university: A path analytic validation of tinto's model'. *Journal of Educational Psychology*, vol. 75, no.2, p. 215.
- PASCARELLA, E., TERENCEZINI, P. & FELDMAN, K. 2005. *How college affects students*, Jossey-Bass San Francisco, CA.
- PATTON, M. 1990. *Qualitative evaluation and research methods*, SAGE Publications Inc.
- PEKRUN, R. & LINNENBRINK-GARCIA, L. 2012. *Academic emotions and student engagement*, Springer.
- PHILLIPS, R., MAOR, D., PRESTON, G. & CUMMING-POTVIN, W. 2012. Exploring learning analytics as indicators of study behaviour. *World Conference on Educational Multimedia, Hypermedia and Telecommunications*. Denver, CO.
- PICCIANO, A. 2012. 'The evolution of big data and learning analytics in american higher education'. *Journal of Asynchronous Learning Networks*, vol. 16, no.3, pp. 9-20.
- PIETRAS, S. 2010. *The impact of academic advising on gpa and retention at the community college level*. Doctoral Dissertation, Indiana University of Pennsylvania.
- PLANT, A., ERICSSON, A., HILL, L. & ASBERG, K. 2005. 'Why study time does not predict grade point average across college students: Implications of deliberate practice for academic performance'. *Contemporary Educational Psychology*, vol. 30, no.1, pp. 96-116.
- POULOS, A. & MAHONY, J. 2008. 'Effectiveness of feedback: The students' perspective'. *Assessment & Evaluation in Higher Education*, vol. 33, no.2, pp. 143-154.
- PRICE, L. & KIRKWOOD, A. 2014. 'Using technology for teaching and learning in higher education: A critical review of the role of evidence in informing practice'. *Higher Education Research & Development*, vol. 33, no.3, pp. 549-564.
- PRINSLOO, P., SLADE, S. & GALPIN, F. Learning analytics: Challenges, paradoxes and opportunities for mega open distance learning institutions. *Proceedings of the 2nd International Conference on Learning Analytics and Knowledge*. ACM.
- QUALTRICS 2014. Qualtrics [software]. Provo: Author. Google Scholar.

- RADLOFF, A. & COATES, H. 2010. 'Doing more for learning: Enhancing engagement and outcomes: Australasian survey of student engagement: Australasian student engagement report'.
- REDDICK, K., TRIFILO, J., ASBY, S., MAJEWSKI, D. & GEISLER, J. 2014. Maximizing the use of an early alert system through advisor outreach. *Academic advising today*, 37 (4).
- REEVES, T. 2006. 'Design research from a technology perspective'. *Educational Design Research*, vol. 1, no.3, pp. 52-66.
- REYES, J. A. 2015. 'The skinny on big data in education: Learning analytics simplified'. *TechTrends*, vol. 59, no.2, pp. 75-80.
- ROBINSON, C. & HULLINGER, H. 2008. 'New benchmarks in higher education: Student engagement in online learning'. *Journal of Education for Business*, vol. 84, no.2, pp. 101-109.
- ROBINSON, S., POPE, D. & HOLYOAK, L. 2013. 'Can we meet their expectations? Experiences and perceptions of feedback in first year undergraduate students'. *Assessment & Evaluation in Higher Education*, vol. 38, no.3, pp. 260-272.
- RODRIGUEZ, O. 2012. 'Moocs and the ai-stanford like courses: Two successful and distinct course formats for massive open online courses'. *European Journal of Open, Distance and E-Learning*, vol. 15, no.2.
- ROMERO, C. & VENTURA, S. 2010. 'Educational data mining: A review of the state of the art'. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, vol. 40, no.6, pp. 601-618.
- ROMERO, C. & VENTURA, S. 2013. 'Data mining in education'. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, vol. 3, no.1, pp. 12-27.
- RUBEL, A. & JONES, K. M. 2016. 'Student privacy in learning analytics: An information ethics perspective'. *The Information Society*, vol. 32, no.2, pp. 143-159.
- SACKERS, N., SECOMB, B. & HULETT, H. 2008. 'How well do you know your clients?: International students' preferences for learning about library services'. *Australian Academic & Research Libraries*, vol. 39, no.1, pp. 38-55.
- SAFER, N. & FLEISCHMAN, S. 2005. 'Research matters: How student progress monitoring improves instruction'. *Educational Leadership*, vol. 62, no.5, pp. 81-83.
- SANTOS, J. & A, R. 1999. 'Cronbach's alpha: A tool for assessing the reliability of scales'. *Journal of Extension*, vol. 37, no.2, pp. 1-5.
- SARGEANT, J., CURRAN, V., ALLEN, M., JARVIS-SELINGER, S. & HO, K. 2006. 'Facilitating interpersonal interaction and learning online: Linking theory and practice'. *Journal of Continuing Education in the Health Professions*, vol. 26, no.2, pp. 128-136.
- SAUNDERS, M., LEWIS, P. & THORNHILL, A. 2012. *Research methods for business students*, London, Pearson Education Limited.

- SAUNDERS, M. & TOSEY, P. 2012. 'The layers of research design'. *Rapport, Winter*, vol. 2013, pp. 58-59.
- SCHEFFEL, M., DRACHSLER, H., STOYANOV, S. & SPECHT, M. 2014. 'Quality indicators for learning analytics'. *Journal of Educational Technology & Society*, vol. 17, no.4, p. 117.
- SCHUNK, D. 1991. 'Self-efficacy and academic motivation'. *Educational Psychologist*, vol. 26, no.3-4, pp. 207-231.
- SCHWEBEL, D., WALBURN, N., JACOBSEN, S., JERROLD, K. & KLYCE, K. 2008. 'Efficacy of intrusively advising first-year students via frequent reminders for advising appointments'. *NACADA Journal*, vol. 28, no.2, pp. 28-32.
- SCLATER, N. 2014. Engagement reporting tools for blackboard and moodle. Available: <http://sclater.com/blog/engagement-reporting-tools-for-blackboard-and-moodle/> [Accessed January 5, 2015].
- SCLATER, N. & BAILEY, P. 2015. 'Code of practice for learning analytics'. *Joint Information Systems Committee (JISC)*, vol.
- SCLATER, N., PEASGOOD, A. & MULLAN, J. 2016. 'Learning analytics in higher education'. *London: Jisc. Accessed February*, vol. 8, p. 2017.
- SEIDMAN, A. 2005. *College student retention: Formula for student success*, Greenwood Publishing Group.
- SEIDMAN, A. 2016. 'College student retention: A primer'. *A presentation*, vol.
- SEKARAN, U. 2006. *Research methods for business: A skill building approach*, John Wiley & Sons.
- SERGIS, S. & SAMPSON, D. G. 2017. Teaching and learning analytics to support teacher inquiry: A systematic literature review. *Learning analytics: Fundamentals, applications, and trends*. Springer.
- SERRANO-LAGUNA, Á. & FERNÁNDEZ-MANJÓN, B. Applying learning analytics to simplify serious games deployment in the classroom. Global Engineering Education Conference (EDUCON), 2014 IEEE. IEEE.
- SHEARD, J., CARBONE, A. & HURST, J. 2010. 'Student engagement in first year of an ICT degree: Staff and student perceptions'. *Computer Science Education*, vol. 20, no.1, pp. 1-16.
- SHEN, G. 2013. Big data, analytics and elections. *Analytics Magazine*. Catonsville, USA: INFORMS (the Institute for Operations Research and the Management Sciences).
- SHENTON, A. 2004. 'Strategies for ensuring trustworthiness in qualitative research projects'. *Education for Information*, vol. 22, no.2, pp. 63-75.
- SHUM, S., KNIGHT, S. & LITTLETON, K. Learning analytics. UNESCO Institute for Information Technologies in Education. Policy Brief. Citeseer.
- SIEMENS, G. 2010. 'What are learning analytics? Elearnspace'. *Retrieved from*, vol.
- SIEMENS, G. 2011. 'How data and analytics can improve education'.

- SIEMENS, G. 2013. 'Learning analytics: The emergence of a discipline'. *American Behavioral Scientist*, vol., p. 0002764213498851.
- SIEMENS, G., DAWSON, S. & LYNCH, G. 2013. Improving the quality and productivity of the higher education sector: Policy and strategy for systems-level deployment of learning analytics. Available: <https://pdfs.semanticscholar.org/d307/34019734c219f6ab83af3dcebfa39c9e8b84.pdf> [Accessed September 28, 2015].
- SIEMENS, G. & LONG, P. 2011. 'Penetrating the fog: Analytics in learning and education'. *EDUCAUSE Review*, vol. 46, no.5, p. 30.
- SIMONS, J. 2011. *A national study of student early alert models at four-year institutions of higher education*, ERIC.
- SIMPSON, B. & ARMATAS, C. 2003. Students' interaction with online learning activities: The role of study strategies and goals and computer attitudes. *ASCILITE*. Adelaide.
- SIMPSON, O. 2005. 'The costs and benefits of student retention for students, institutions and governments'. *Studies in Learning, Evaluation Innovation and Development*, vol. 2, no.3, pp. 34-43.
- SINGELL, L. & WADDELL, G. 2010. 'Modeling retention at a large public university: Can at-risk students be identified early enough to treat?'. *Research in Higher Education*, vol. 51, no.6, pp. 546-572.
- SKINNER, E. & PITZER, J. 2012. Developmental dynamics of student engagement, coping, and everyday resilience. *Handbook of research on student engagement*. Springer.
- SLADE, S. & GALPIN, F. Learning analytics and higher education: Ethical perspectives. *Learning Analytics and Knowledge*. ACM.
- SLADE, S. & PRINSLOO, P. 2013. 'Learning analytics ethical issues and dilemmas'. *American Behavioral Scientist*, vol. 57, no.10, pp. 1510-1529.
- SMITH, V., LANGE, A. & HUSTON, D. 2012. 'Predictive modeling to forecast student outcomes and drive effective interventions in online community college courses'. *Journal of Asynchronous Learning Networks*, vol. 16, no.3, pp. 51-61.
- SPILLER, D. 2009. 'Assessment: Feedback to promote student learning'. *Manuscript submitted for publication, The University of Waikato, The University of Waikato, Hamilton, New Zealand*, vol.
- STERNBERG, R. J. 2013. 'Research to improve retention'. *Consultado en: Inside Higher Education* <http://www.insidehighered.com/views/2013/02/07/essay-use-researchimprove-student-retention#ixzz2KDVkyYP4>, vol.
- STEWART, C. 2017. 'Learning analytics: Shifting from theory to practice'. *Journal on Empowering Teaching Excellence*, vol. 1, no.1, p. 10.
- STRYDOM, J. F. & MENTZ, M. 2010. *Focusing the student experience on success through student engagement*, Council on Higher Education Pretoria.

- SWAIL, W. 1995. *The development of a conceptual framework to increase student retention in science, engineering, and mathematics programs at minority institutions of higher education*. Doctoral Dissertation, George Washington University.
- SWAIL, W. 2004. The art of student retention: A handbook for practitioners and administrators. *Annual Recruitment and Retention Conference*. Austin: Texas: Educational Policy Institute.
- SWANSON, D. 2004. 'Advancing methodological knowledge within state and local demography: A case study'. *Population Research and Policy Review*, vol. 23, no.4, pp. 379-398.
- TAIR, M. & EL-HALEES, A. 2012. 'Mining educational data to improve students' performance: A case study'. *International Journal of Information*, vol. 2, no.2.
- TAMPKE, D. 2013. 'Developing, implementing, and assessing an early alert system'. *Journal of College Student Retention: Research, Theory & Practice*, vol. 14, no.4, pp. 523-532.
- TASHAKKORI, A. & TEDDLIE, C. 1998. *Mixed methodology: Combining qualitative and quantitative approaches*, SAGE Publications Inc.
- TAVAKOL, M. & DENNICK, R. 2011. 'Making sense of cronbach's alpha'. *International Journal of Medical Education*, vol. 2, p. 53.
- TEASLEY, M. & BUCHANAN, E. 2013. 'Capturing the student perspective: A new instrument for measuring advising satisfaction'. *NACADA Journal*, vol. 33, no.2, pp. 4-15.
- TEDDLIE, C. & TASHAKKORI, A. 2009. *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences*, SAGE Publications Inc.
- THALER, R. & SUNSTEIN, C. 2008. *Nudge: Improving decisions about health, wealth, and happiness*. New Haven, CT: Yale University Press.
- TIMMERS, C. F., WALRAVEN, A. & VELDKAMP, B. P. 2015. 'The effect of regulation feedback in a computer-based formative assessment on information problem solving'. *Computers & education*, vol. 87, pp. 1-9.
- TINSLEY, H. & WEISS, D. 2000. 'Interrater reliability and agreement of subjective judgments'. *Journal of Counseling Psychology*, vol. 22, no.4, pp. 385-376.
- TINTO, V. 1975. 'Dropout from higher education: A theoretical synthesis of recent research'. *Review of Educational Research*, vol. 45, no.1, pp. 89-125.
- TINTO, V. 1993. *Leaving college: Rethinking the causes and cures of student attrition*, University of Chicago Press.
- TINTO, V. 2012. 'Enhancing student success: Taking the classroom success seriously'. *The International Journal of the First Year in Higher Education*, vol. 3, no.1, p. 1.
- TROCHIM, W. 2005. *Research methods: The concise knowledge base*, Atomic Dog Publishing.

- VAN BARNEVELD, A., ARNOLD, K. E. & CAMPBELL, J. P. 2012. 'Analytics in higher education: Establishing a common language'. *EDUCAUSE learning initiative*, vol. 1, pp. 1-11.
- VAN RYZIN, M., GRAVELY, A. & ROSETH, C. 2009. 'Autonomy, belongingness, and engagement in school as contributors to adolescent psychological well-being'. *Journal of Youth and Adolescence*, vol. 38, no.1, pp. 1-12.
- VENKATESH, V., BROWN, S. & BALA, H. 2013. 'Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems'. *MIS Quarterly*, vol. 37, no.1, pp. 21-54.
- VERBERT, K., DUVAL, E., KLERKX, J., GOVAERTS, S. & SANTOS, J. L. 2013. 'Learning analytics dashboard applications'. *American Behavioral Scientist*, vol. 57, no.10, pp. 1-20.
- VOELKL, K. 2012. School identification. *Handbook of research on student engagement*. Springer.
- VOYLES, M. J. 2011. 'Student academic success as related to student age and gender'.
- WELSH, S. & MCKINNEY, S. 2015. 'Clearing the fog: A learning analytics code of practice'.
- WEST, D., HEATH, D. & HUIJSER, H. 2015. 'Let's talk learning analytics: A framework for implementation in relation to student retention'. *Online Learning*, vol. 20, no.2.
- WEST, D., HUIJSER, H., HEATH, D., LIZZIO, A., TOOHEY, D., MILES, C., SEARLE, B. & BRONNIMANN, J. 2016. 'Higher education teachers' experiences with learning analytics in relation to student retention'. *Australasian Journal of Educational Technology*, vol. 32, no.5, pp. 48-60.
- WILLCOXSON, L., COTTER, J. & JOY, S. 2011. 'Beyond the first-year experience: The impact on attrition of student experiences throughout undergraduate degree studies in six diverse universities'. *Studies in Higher Education*, vol. 36, no.3, pp. 331-352.
- WILLIS, J., CAMPBELL, J. & PISTILLI, M. 2013. Ethics, big data, and analytics: A model for application. *EDUCAUSE Review* [Online]. Available: <http://er.educause.edu/articles/2013/5/ethics-big-data-and-analytics-a-model-for-application> [Accessed October 2, 2015].
- WILLIS, J. E., SLADE, S. & PRINSLOO, P. 2016. 'Ethical oversight of student data in learning analytics: A typology derived from a cross-continental, cross-institutional perspective'. *Educational Technology Research and Development*, vol. 64, no.5, pp. 881-901.
- WILLMS, D. 2003. *Student engagement at school: A sense of belonging and participation: Results from pisa 2000*, Publications de l'OCDE.
- WINTRUP, J. 2017. 'Higher education's panopticon? Learning analytics, ethics and student engagement'. *Higher Education Policy*, vol. 30, no.1, pp. 87-103.

- WOLFF, A. & ZDRAHAL, Z. 2012. Improving retention by identifying and supporting "at-risk" students. *Educause Review Online* [Online]. Available: <http://er.educause.edu/articles/2012/7/improving-retention-by-identifying-and-supporting-atrisk-students> [Accessed October 11, 2013].
- WOLFF, A., ZDRAHAL, Z., NIKOLOV, A. & PANTUCEK, M. Improving retention: Predicting at-risk students by analysing clicking behaviour in a virtual learning environment. *Learning Analytics and Knowledge*. ACM.
- WONG, B. T. M. 2017. 'Learning analytics in higher education: An analysis of case studies'. *Asian Association of Open Universities Journal*, vol. 12, no.1, pp. 21-40.
- WONG, L. & FONG, M. 2014. 'Student attitudes to traditional and online methods of delivery'. *Journal of Information Technology Education*, vol. 13, no.1, pp. 1-3.
- WU, X., KUMAR, V., QUINLAN, J. R., GHOSH, J., YANG, Q., MOTODA, H., MCLACHLAN, G. J., NG, A., LIU, B. & PHILIP, S. Y. 2008. 'Top 10 algorithms in data mining'. *Knowledge and information systems*, vol. 14, no.1, pp. 1-37.
- XU, B. & RECKER, M. 2012. 'Teaching analytics: A clustering and triangulation study of digital library user data'. *Educational Technology & Society*, vol. 15, no.3, pp. 103-115.
- YEAGER, D. & WALTON, G. 2011. 'Social-psychological interventions in education they're not magic'. *Review of Educational Research*, vol. 81, no.2, pp. 267-301.
- YIN, R. 2013. *Case study research: Design and methods*, SAGE Publications Inc.
- YU, C., DIGANGI, S., JANNASCH-PENNELL, A. & KAPROLET, C. 2010. 'A data mining approach for identifying predictors of student retention from sophomore to junior year'. *Journal of Data Science*, vol. 8, no.2, pp. 307-325.
- YUAN, L. & POWELL, S. 2013. Moocs and open education: Implications for higher education. *CETIS* [Online]. Available: <http://publications.cetis.org.uk/2013/667> [Accessed October 11, 2015].
- ZHANG, A. & AASHEIM, C. 2011. 'Academic success factors: An it student perspective'. *Journal of Information Technology Education*, vol. 10, pp. 309-331.

## APPENDIX A

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### **COPY OF FINAL ETHICS APPROVAL LETTER STUDENT PERSPECTIVE STUDY**

#### **Final Approval – Ethics Application Reference - 5201300866**

From: Faculty of Science Research Office <sci.ethics@mq.edu.au>  
Date: Fri, Nov 29, 2013 at 4:23 PM  
Subject: Approved  
To: Dr Ayse Bilgin <ayse.bilgin@mq.edu.au>, Prof Deborah Richards <deborah.richards@mq.edu.au>, Mrs Amara Atif <Amara.Atif@mq.edu.au>  
Cc: Prof Richie Howitt <richie.howitt@mq.edu.au>, Ms Katherine Wilson <katherine.wilson@mq.edu.au>

Dear Prof Richards,

RE: Ethics project entitled: “Learning analytics to determine in-course student academic success in higher education”- Ref number: 5201300866.

Thank you for your recent correspondence. Your response has addressed the issues raised by the Faculty of Science Human Research Ethics Sub-Committee and approval is granted to phase one of this research project, as requested in this application. This email constitutes ethical approval only.

This research meets the requirements of the National Statement on Ethical Conduct in Human Research (2007). The National Statement is available at the following web site:

[http://www.nhmrc.gov.au/\\_files\\_nhmrc/publications/attachments/e72.pdf](http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/e72.pdf).

The following personnel are authorised to conduct this research:

Dr Ayse Bilgin  
Mrs Amara Atif  
Prof Deborah Richards

**NB. STUDENTS: IT IS YOUR RESPONSIBILITY TO KEEP A COPY OF THIS APPROVAL EMAIL TO SUBMIT WITH YOUR THESIS.**

Please note the following standard requirements of approval:

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).
2. Approval will be for a period of five (5) years subject to the provision of annual reports.  
Progress Report 1 Due: 29 Nov 2014  
Progress Report 2 Due: 29 Nov 2015  
Progress Report 3 Due: 29 Nov 2016  
Progress Report 4 Due: 29 Nov 2017  
Final Report Due: 29 Nov 2018

NB. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report for the project.

Progress reports and Final Reports are available at the following website:

[http://www.research.mq.edu.au/for/researchers/how\\_to\\_obtain\\_ethics\\_approval/human\\_research\\_ethics/forms](http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms)

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. All amendments to the project must be reviewed and approved by the Committee before implementation. Please complete and submit a Request for Amendment Form available at the following website:

[http://www.research.mq.edu.au/for/researchers/how\\_to\\_obtain\\_ethics\\_approval/human\\_research\\_ethics/forms](http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms)

5. Please notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that affect the continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University. This information is available at the following websites: [http://www.mq.edu.au/human\\_research\\_ethics/policy](http://www.mq.edu.au/human_research_ethics/policy)

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy of this email as soon as possible. Internal and External funding agencies will not be informed that you have approval for your project and funds will not be released until the Research Grants Management Assistant has received a copy of this email.

If you need to provide a hard copy letter of approval to an external organisation as evidence that you have approval, please do not hesitate to contact the Ethics Secretariat at the address below.

Please retain a copy of this email as this is your official notification of ethics approval.

Yours sincerely

Faculty of Science Human Ethics Committee Secretariat

Professor Richard Howitt (Chair, Dept of Environment & Geography)

Katherine J. Wilson, Research Administrator

Faculty of Science

Macquarie University

NSW 2109 Australia

E: [sci.ethics@mq.edu.au](mailto:sci.ethics@mq.edu.au)

## **COPY OF FINAL ETHICS APPROVAL LETTER TEACHER PERSPECTIVE STUDY**

### **Final Approval – Ethics Application Reference - 5201500031**

From: Faculty of Science Research Office <sci.ethics@mq.edu.au>

Sent: Wednesday, 2 March 2016 1:49 PM

To: Deborah Richards

Cc: sci.ethics; Katherine Shevelev; Cathi Humphrey-Hood

Subject: Ethics project 5201500031 Progress Report Approved

Dear Prof Richards,

Title of project: “Validating the effectiveness of the Moodle Engagement Block (MEB): Teacher attitudes and preferences”

Thank you for your Progress Report. Approval of the Progress Report has been granted, effective 25/02/2016.

Please note the following standard requirements of approval:

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).
2. Approval will be for a period of five (5) years subject to the provision of annual reports. Your next progress report is due on 25/02/2017.

If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report on the project.

Progress Reports and Final Reports are available at the following website:

[http://www.research.mq.edu.au/for/researchers/how\\_to\\_obtain\\_ethics\\_approval/human\\_research\\_ethics/forms](http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms)

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. Please notify the Committee of any amendment to the project.

5. Please notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that might affect continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University.

This information is available at:

[http://www.research.mq.edu.au/about/research\\_@\\_macquarie/policies,\\_procedure\\_s\\_and\\_conduct](http://www.research.mq.edu.au/about/research_@_macquarie/policies,_procedure_s_and_conduct)

Yours sincerely,

Peter Busch, Chair

Faculty of Science and Engineering

Human Research Ethics Sub-Committee

Macquarie University

NSW 2109

## APPENDIX B

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### COPY OF INFORMATION AND CONSENT FORM STUDENT PERSPECTIVE STUDY

#### A Study to Determine In-Course Student Academic Success in Higher Education

##### Information Statement:

You are invited to participate in a study to assist researchers to design a “student early alert system”. Student early alert system monitor a student’s academic performance. These systems often, but not always, include direct outreach to students in academic or other types of difficulty that may interfere with academic success. The early alert is designed to let students know that an instructor is concerned about their class performance. The purpose of the study is to identify the factors, gather feedback and students’ behaviours in order to assess student experiences with the early alert process. Your feedback and comments will help the department and university tremendously as they work to improve services they provide to students.

The study is being conducted by Ms Amara Atif to meet the requirements for the degree of PhD (Comp Sc) under the supervision of the academics listed below:

Prof. Deborah Richards Principal Supervisor Department of Computing Faculty of Science and Engineering Email: <a href="mailto:deborah.richards@mq.edu.au">deborah.richards@mq.edu.au</a> Phone: 9850 9567	Dr Ayse Bilgin Co-Supervisor Department of Statistics Faculty of Science and Engineering Email: <a href="mailto:ayse.bilgin@mq.edu.au">ayse.bilgin@mq.edu.au</a> Phone: 9850 8509
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If you decide to participate, you will be asked to complete a survey that will take around 10-15 minutes of your time.

Please complete the questions below, either by writing your answer or ticking the appropriate option. Any confidential information pertaining to individuals will not be released to anybody outside the research team. Only the aggregated results will be presented and/or published. Any information or personal details gathered in the course of the research are confidential. No individual will be identified in any publication of the results. Only the researchers listed above will have access to the data. A summary of the results of the data will be posted when available on the unit’s iLearn site and from the web pages of the investigators (mentioned above).

Participation in this study is entirely voluntary: you are not obliged to participate and if you decide to participate, you are free to withdraw at any time without having to give a reason and without consequence.

The ethical aspects of this study have been approved by the Macquarie University Human Research Ethics Committee. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through the Director, Research Ethics (telephone (02) 9850 7854 and

(02) 9850 7854; email [ethics@mq.edu.au](mailto:ethics@mq.edu.au)). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

**Consent Statement:**

- I have read and understand the information above. I agree to participate in this research, knowing that I can withdraw from further participation in the research at any time without consequence.

## **COPY OF INFORMATION AND CONSENT FORM TEACHER PERSPECTIVE STUDY**

Department of Computing  
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Chief Investigator's / Supervisor's Name: Deborah Richards  
Chief Investigator's / Supervisor's Title: Professor

### **Participant Information and Consent Form**

#### **Name of Project: Validating the effectiveness of the Moodle Engagement Block (MEB): Teacher attitudes and preferences for using student early alerts**

You are invited to participate in a study to validate the Moodle Engagement Block (MEAP) in iLearn. The purpose of the study is to investigate convenor and teacher experiences with MEAP and their behaviours, attitudes and preferences in identifying students at risk and any interventions such sending early alerts to students.

The study is being conducted by Prof. Deborah Richards in the Department of Computing (98509567, [deborah.richards@mq.edu.au](mailto:deborah.richards@mq.edu.au)); Mr Chris Froissard in the Learning and Teaching Centre (9850 9635, [chris.froissard@mq.edu.au](mailto:chris.froissard@mq.edu.au)); Dr Danny Liu in the Learning and Teaching Centre (9850 7967, [danny.liu@mq.edu.au](mailto:danny.liu@mq.edu.au)). *The research is being conducted as part of a Macquarie University Teaching Grant* and additionally is being conducted by Ms Amara Atif to meet the requirements of PhD under the supervision of Prof. Deborah Richards in the Department of Computing (98509567, [deborah.richards@mq.edu.au](mailto:deborah.richards@mq.edu.au)) of the Department of Computing.

If you decide to participate, you will be provided with an introduction to the MEAP and how to use it and then be asked questions about when early alerts might be useful in your unit, what the triggers might be and what your likely response to the alert would be for each type of trigger. To assist, you will be provided with some examples. Approximately every four weeks we will check with you how you are going and at the end we will ask you questions about your experience. We will record the interviews and provide you with a transcript of the interview afterwards. After the grades are processed, we will ask you for student grades for comparison against MEAP data for each student to determine whether MEAP was able to predict their outcome.

Any information or personal details gathered in the course of the study are confidential, except as required by law. Your name and unit will be de-identified in any publications related to this work. Only the researchers will have direct access to the data. A summary of the results of the data for your unit will be made available

to you in a report. Combined summarised results will be provided to other interested parties.

Participation in this study is entirely voluntary: you are not obliged to participate and if you decide to participate, you are free to withdraw at any time without having to give a reason and without consequence.

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I, (participant's name) have read (or, where appropriate, have had read to me) and understand the information above and any questions I have asked have been answered to my satisfaction. I agree to participate in this research, knowing that I can withdraw from further participation in the research at any time without consequence. I have been given a copy of this form to keep.

Participant's Name: \_\_\_\_\_

(Block letters)

Participant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Investigator's Name: \_\_\_\_\_

(Block letters)

Investigator's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

The ethical aspects of this study have been approved by the Macquarie University Human Research Ethics Committee. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through the Director, Research Ethics (telephone (02) 9850 7854; email [ethics@mq.edu.au](mailto:ethics@mq.edu.au)). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

**(INVESTIGATOR'S [OR PARTICIPANT'S] COPY)**

## APPENDIX C

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### PILOT and CASE STUDIES 1-3 INITIAL SURVEY

#### Section I: Demographic Information

I.1 My Macquarie University student ID is \_\_\_\_\_

I.2 I am:

- ☐ Male
- ☐ Female
- ☐ I don't identify as male or female

I.3 My age (in years) is:

- ☐ 18 or younger
- ☐ 19-24
- ☐ 25-34
- ☐ 35-49
- ☐ 50 or older
- ☐ Prefer not to say

I.4 This semester, I am studying \_\_\_\_\_ units.

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5

I.5 My first language is:

- ☐ English
- ☐ Other than English

I.6 I am an:

- ☐ International Student
- ☐ Aboriginal/Torres Strait Islander Student
- ☐ Neither

I.7 At Macquarie University, my student status is:

- ☐ First year, first semester student
- ☐ I came from another university
- ☐ First year student, second semester student
- ☐ 2<sup>nd</sup> year student
- ☐ 3<sup>rd</sup> year student
- ☐ Other, If OTHER, please specify. \_\_\_\_\_

I.8 I am enrolled with faculty of:

- ☐ Arts
- ☐ Business and Economics
- ☐ Human Sciences
- ☐ Science and Engineering

I.9 How many HOURS are you working per week at the moment?

- ☐ <5
- ☐ 5-10
- ☐ 11-15
- ☐ 16-20
- ☐ 20
- ☐ Not working

I.10 Do you have other responsibilities such as, a carer or similar.

- ☐ Yes
- ☐ No

If YES, please provide the details. \_\_\_\_\_

## Section II: Learning & Teaching Factors

II.1 I am doing this unit for the first time.

- ☐ Yes
- ☐ No

If NO, when you did this unit (semester and year). \_\_\_\_\_

II.2 I have any prior knowledge of this unit.

- ☐ Yes
- ☐ No

If YES, please specify your content knowledge. \_\_\_\_\_

II.3 I have read the unit guide.

- ☐ Yes
- ☐ No

If NO, please provide a reason. \_\_\_\_\_

II.4 I understand the unit requirements.

- ☐ Completely
- ☐ Partially
- ☐ Not at all

II.5 I have the following skills/ability to undertake this unit. Rate yourself on each of the following traits on a scale of 1 (not competent), 2 (somewhat competent), 3 (uncertain), 4 (competent) and 5 (highly competent)? (Mark one in each row)

	1	2	3	4	5
Academic ability					
Competitiveness					
Computer skills					
Problem solving skills					
Programming ability					
Critical thinking skills					
Ability to manage my time effectively					
Interpersonal skills					

II.6 I feel well prepared to undertake this unit.

- ☐ Not at all
- ☐ Very little
- ☐ Fairly well
- ☐ Quite well
- ☐ Very well
- ☐ Unsure

II.7 I have programming experience outside this unit.

- ☐ Yes
- ☐ No

If YES, please provide further information. \_\_\_\_\_

II.8 I am taking this unit because: (Mark all that applies)

- ☐ Degree requirement
- ☐ Want to learn about computing
- ☐ Planet Unit
- ☐ Other If OTHER, please describe. \_\_\_\_\_

II.9 How would you rate your motivation in this unit, on a scale of 1 (not true), 2 (slightly true), 3 (moderately true), 4 (mostly true) and 5 (very true)? (Mark one in each row)

	1	2	3	4	5
I am motivated to do my required work in this unit					
I feel confident that I will do well in this unit					
I have to work too hard to succeed in this unit					
To accomplish my goals, it is important that I do well in this unit					
I persist even when an assessment task is challenging for me					

II.10a Do you think there are factors that may affect your academic performance in this unit?

- ☐ Yes
- ☐ No

II.10b If YES, which of the following factors can affect your academic performance in this unit? (Mark all that applies)

- ☐ Family responsibility/commitments
- ☐ Emotional health (lack of motivation, fear of failure etc.)
- ☐ Physical health
- ☐ Financial issues
- ☐ Felt under-prepared for this unit
- ☐ Communication skills
- ☐ Issue with the teaching staff
- ☐ Lack of student academic support
- ☐ Religious background
- ☐ Social coping skills
- ☐ Problems with daily travel
- ☐ Paid work commitments
- ☐ Other If OTHER, please describe. \_\_\_\_\_

II.11 Would you like to be contacted if your performance in the unit is unsatisfactory?

- ☐ Yes
- ☐ No

If YES, WHEN you like to be contacted? (Mark all that applies)

- ☐ As soon it occurs
- ☐ The first time it occurs
- ☐ Only after it happens more than once
- ☐ Following first assessment results
- ☐ Before HECS census date
- ☐ Before Exclusion date
- ☐ Other If OTHER, please describe. \_\_\_\_\_

II.12 For what specific behaviours do you want to be contacted? (Mark all that applies)

- ☐ Frequent absences
- ☐ Lack of participation/effort
- ☐ Low scores in assessments
- ☐ Missing work
- ☐ Not logged in to LMS for more than a week
- ☐ Discussion postings not read
- ☐ No participation in discussion forums
- ☐ Announcements not read
- ☐ Lecture content or lecture resources not viewed
- ☐ In-class behavioural problems
- ☐ None
- ☐ Other If OTHER, please describe. \_\_\_\_\_

II.13 How would you like to be advised about opportunities to seek assistance?  
(Mark all that applies)

- ☐ Email
- ☐ Letter/post card
- ☐ Mobile phone
- ☐ Home telephone
- ☐ Face-to-face
- ☐ Other If OTHER, please describe. \_\_\_\_\_

II.14 From the following strategies, which do you think would motivate you to seek help? (Mark all that applies)

- ☐ Talking with the teaching staff to work out a plan to improve my grade
- ☐ Receiving a specific written plan on how to improve my grade from the teaching staff
- ☐ Meeting with a tutor(s)
- ☐ Meeting with a tutor(s) and other students that are also having problems in the class to form a study group
- ☐ Talking with a counsellor/support services about how to work through my problems
- ☐ Attending a workshop/seminars with other students to go over improvement strategies
- ☐ Getting an email/letter about how I am doing in a class is enough
- ☐ Getting a phone call from the teaching or support staff to help me work through my options
- ☐ Actively participating in discussion forums to get information from the teaching staff and other students on how to improve
- ☐ Manage myself
- ☐ Other If OTHER, please describe. \_\_\_\_\_

II.15 How would you rate your expectations of this unit, on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)? (Mark one in each row)

	1	2	3	4	5
Easy					
Minimal course work					
To be contacted regularly with academic support					

II.16 How would you rate your expectation(s) from the teaching staff in this unit, on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)? (Mark one in each row)

	1	2	3	4	5
Quality of teaching is high					
Teaching staff are approachable					
Teaching staff are usually available to discuss my work and give helpful feedback					

II.17 Do you have any physical disability or a diagnosed learning disability?

- ☐ Yes
- ☐ No

### **Section III. Institutional Factors**

III.1 What led you to enrol at Macquarie University? (Mark all that applies)

- ☐ Close to home
- ☐ Had the program I wanted to study
- ☐ Affordable
- ☐ Good reputation
- ☐ Only university I got accepted
- ☐ A family member attended or is attending
- ☐ Other If OTHER, please describe. \_\_\_\_\_

III.2a Are you aware of the available university support services?

- ☐ Yes
- ☐ No

III.2b If YES, please name at least three (3) support services. \_\_\_\_\_

III.3 Are you currently taking advantage of any university support services?

- ☐ Yes
- ☐ No

If YES, please provide further information. \_\_\_\_\_

III.4 Would it be helpful to have access to a small document, such as a learning support guide (other than unit guide) that outlines the support services available, expectations of students and processes at Macquarie University?

- ☐ Yes
- ☐ No

## FOLLOW-UP SURVEY

1. Which of the following factors, if any, impeded your academic performance in this unit? (Mark all that applies)

- ☐ Family responsibility/commitments
- ☐ Emotional health (lack of motivation, fear of failure etc.)
- ☐ Physical health
- ☐ Financial issues
- ☐ Felt under-prepared for this unit
- ☐ Communication skills
- ☐ Issue with the teaching staff
- ☐ Lack of student academic support
- ☐ Religious commitments/activities
- ☐ Social coping skills
- ☐ Problems with daily travel
- ☐ Paid work commitments
- ☐ Other \_\_\_\_\_

2. Were you contacted by an early alert notice after this semester started to discuss your academic performance in this unit?

- ☐ Yes
- ☐ No

If No is selected, then skip to the end of survey. Is there anything else you would ...

3. Did you follow-up or take any action as a result of the early alert notice?

- ☐ Yes
- ☐ No

4. What specific action(s) did you take when you were first contacted by an early alert notice? (Mark all that applies)

- ☐ Set an appointment for in-person meeting with my teaching staff
- ☐ Emailed teaching staff and asked for more information on what to do
- ☐ Ignored the early alert message
- ☐ Got attentive and started to work seriously
- ☐ Other \_\_\_\_\_

5. What was your attitude towards being contacted via an early alert notice? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)? (Mark one in each row)

	1	2	3	4	5
I was glad to speak to my teaching staff about my situation					
I appreciated that there was someone watching out for me					
I was grateful that somebody contacted me about my academic standing in this unit					

6. Were you advised to seek help from any student support services?

- ☐ Yes
- ☐ No

If No is selected, then skip to the Q8...Did the early alert notice provide you with campus student support services that you did not previously know about?

7. Which student support services from the campus wellbeing were you advised to visit? (Mark all that applies)

- ☐ Financial aid services
- ☐ Disability service (Disability Support Unit-DSU)
- ☐ Counselling service
- ☐ Welfare service (financial aid services, academic progress issues)
- ☐ Chaplaincy service
- ☐ Numeracy centre
- ☐ Health and wellbeing service
- ☐ Learning skills program
- ☐ Career & Employment service
- ☐ Education services for overseas students (ESOS)
- ☐ Academic Advice
- ☐ Tech Help
- ☐ Ask.mq.edu.au
- ☐ Other \_\_\_\_\_

8. Did the early alert notice provide you with campus student support services that you did not previously know about?

- ☐ Yes
- ☐ No

9. What is your attitude towards campus wellbeing services at Macquarie University relevant to this unit? (Mark all that applies)

- ☐ The hours of operation for the student support services were convenient
- ☐ Student support services were available to help me
- ☐ Student support services provided me with the accurate information
- ☐ Student support services were able to help resolve my issue(s)
- ☐ Other \_\_\_\_\_

10. Which actions(s) were you advised to take? (Mark all that applies)

- ☐ Speak with the unit convenor/lecturer/tutor
- ☐ Show up to lecture and mixed class on time
- ☐ Attend lecture and mixed class
- ☐ Listen to podcasts of lectures
- ☐ Complete missing/late work (assignments, diagnostic quiz, mid-semester exam, weekly submissions)
- ☐ I did not take any action
- ☐ Other \_\_\_\_\_

11. Did you turn in missing/late work?

- ☐ Yes
- ☐ No

12. Did you apply for Special Consideration for any assignments?

- ☐ Yes
- ☐ No

13. Did you apply for Special Consideration for any assessments (diagnostic quiz or mid-semester exam)?

- ☐ Yes
- ☐ No

14. Did you make up/redo any weekly submissions?

- ☐ Yes
- ☐ No

15. Did you get tutoring help outside the university?

- ☐ Yes
- ☐ No

16. Did you visit a coaching centre outside the university?

- ☐ Yes
- ☐ No

17. Did the Early Alert improve your attendance in this unit?

- ☐ Yes
- ☐ No
- ☐ Unsure

18. Did the Early Alert improve your learning in this unit?

- ☐ Yes
- ☐ No
- ☐ Unsure

19. What is your attitude toward interventions and academic standing in this unit? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)? (Mark one in each row)

	1	2	3	4	5
I feel better prepared to deal with my academic situation					
Now I know where to seek help for my academic studies					
I believe that student support services help					

20. Please indicate how you feel about your current academic standing after you were being contacted by an early alert notification?

- ☐ Much better
- ☐ Somewhat better
- ☐ About the same
- ☐ Somewhat worse
- ☐ Much worse

21. How you would NOW rate your expectation(s) from this unit and REALITY, on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)? (Mark one in each row)

	1	2	3	4	5
Easy					
Minimal course work					
To be contacted regularly with academic support					

22. How you would NOW rate your expectation(s) from the teaching staff in this unit and REALITY, on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)? (Mark one in each row)

	1	2	3	4	5
Quality of teaching is good					
Teaching staff is approachable					
Teaching staff are usually available to discuss my work and give helpful feedback					

23. Overall, how satisfied you are with the Early Alert system?

- ☐ Completely dissatisfied
- ☐ Dissatisfied
- ☐ Neutral
- ☐ Satisfied
- ☐ Completely satisfied

24. Is there anything else you would like us to know?

- ☐ Yes \_\_\_\_\_
- ☐ No

## APPENDIX D

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### COPY OF ALERT EMAIL FROM PILOT and CASE STUDY-1

Dear STUDENT NAME,

You have received a **Low Participation OR Missing Work OR Not Logged in to LMS for \_\_\_\_ number of days** flag for UNIT NAME/UNIT CODE. This means that your instructor is concerned about your performance in class.

I am your Computing Study Buddy contacting you to encourage you to take a few simple steps that could help you succeed. They are as follows:

1. Set-up a meeting with your instructors to discuss this concern and their suggestions on how you might improve your grades.
  - TEACHER NAME (Unit Convenor)
    - Email: \_\_\_\_\_
  - TUTOR NAME (Other Staff)
    - Email: \_\_\_\_\_
2. Macquarie University has a number of student support services and resources designed to help you on your path to graduation. To find out more about these services and resources you can check the following link:  
[Link provided here]
3. The Campus Wellbeing has a number of resources including academic skills counselling, individual and group tutoring, financial and welfare services, disability support unit (DSU) and the numeracy centre. To find out more about these services and resources you can check the following link:  
[Link provided here]

Please take advantage of our student support resources. We believe that you can be successful in your academic studies and hope that you will take advantage of the many support services we offer which can help you in this endeavour. I want you to succeed. I am sure you don't want to fail either. Please take a look at the options suggested, there is help.

STUDENT FIRST NAME, we believe in your abilities to be successful and we are here to help.

Sincerely,  
Computing Study Buddy

## APPENDIX E

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### FINAL STUDY (CASE STUDY-4) RECRUITING ANNOUNCEMENT

Dear student,

Your unit convenor may have been using a “student early alert system” this semester in your iLearn unit to help you learn.

We invite you to participate in a student survey to share your experience and thoughts in relation to this system.

The survey is voluntary and your personal details are confidential and will not be shared with your unit convenor.

The survey will take no more than 10 minutes to complete. When you complete the survey you will have the opportunity to enter the draw to win one of four \$50 JB Hi-Fi vouchers. We will select the winners by the 22 November, 2015 and contact you shortly after.

We value your feedback and hope you will participate in the survey as your responses will help us design a better system that you and your peers will benefit from in future.

Click [survey](#) link to open resource.

[Link provided here]

Or copy and paste the URL below into your internet browser:

[Link provided here]

Follow the link to opt out of future emails:

[Link provided here]

Thank you very much for your cooperation!

## FINAL STUDY (CASE STUDY-4) STUDENT SURVEY

### Section I: Demographic Information

1.1 My student ID (8-digit) is:

1.2 The unit code for which I am filling in this survey is:

[Dropdown list of units is here]

1.3 I am:

- ☐ Male
- ☐ Female
- ☐ I don't identify as male or female

1.4 My age (in years) is:

- ☐ 18 or younger
- ☐ 19-24
- ☐ 25-34
- ☐ 35-49
- ☐ 50 or older
- ☐ Prefer not to say

1.5 My first language is:

- ☐ English
- ☐ Other than English

1.6 I am a(n) \_\_\_\_\_.

- ☐ International Student
- ☐ Aboriginal/Torres Strait Islander Student
- ☐ Neither

1.7 My student enrolment by course load is:

- ☐ Full-time
- ☐ Part-time

1.8 My student status is \_\_\_\_\_. (Mark all that applies)

- ☐ First year, first semester student
- ☐ First year, second semester student
- ☐ Continuing student (2<sup>nd</sup> year, 3<sup>rd</sup> year or above)
- ☐ I came from another university
- ☐ Other If OTHER, please specify. \_\_\_\_\_

1.9 I am enrolled with the faculty of: (Mark all that applies)

- ☐ Arts
- ☐ Business and Economics
- ☐ Human Sciences
- ☐ Science and Engineering

1.10 On average, approximately how many hours did you spend per week on employment?

- ☐ < 5
- ☐ 5 - 10
- ☐ 11 - 15
- ☐ 16 - 20
- ☐ > 20
- ☐ Not working

## **Section II: Early Alerts**

NOTE: Questions 2.1 - 2.4 ask your preferences to allow the possible design of 'early alerts' in future offerings and other units. This section is for future planning only and may not be providing alerts in the current offerings of these units.

2.1 In the future, would you like to be contacted if your performance in a unit is unsatisfactory?

- ☐ Yes
- ☐ No

If No is selected, then skip to 2.2. In the future, for what specific ...

If YES, when would you like to be contacted? (Mark all that apply)

- ☐ As soon it occurs
- ☐ The first time it occurs
- ☐ Only after it happens more than once
- ☐ Following first assessment results
- ☐ Before Census date
- ☐ Before Exclusion date
- ☐ Other If OTHER, please specify. \_\_\_\_\_

2.2 In the future, for what specific behaviours do you want to be contacted? (Mark all that apply)

- ☐ Frequent absences
- ☐ Lack of participation/effort
- ☐ Low scores in assessments
- ☐ Missing work
- ☐ Not logged in to LMS for more than a week
- ☐ Discussion postings not read
- ☐ No participation in discussion forums
- ☐ Announcements not read
- ☐ Lecture content or lecture resources not viewed
- ☐ In-class behavioural problems
- ☐ How I am doing compared to the rest of the class?
- ☐ Plagiarism
- ☐ None
- ☐ Other If OTHER, please specify. \_\_\_\_\_

2.3 In the future, how would you like to be advised about opportunities to seek assistance? (Mark all that apply)

- ☐ University Email
- ☐ Personal Email
- ☐ Face-to-face
- ☐ Letter/post card
- ☐ Mobile phone
- ☐ Home telephone
- ☐ SMS
- ☐ Social networks (i.e. Facebook, Twitter)
- ☐ Other If OTHER, please specify. \_\_\_\_\_

2.4 From the following strategies, which do you think would motivate you to seek help? (Mark all that apply)

- ☐ Talking with the teaching staff to work out a plan to improve my grade
- ☐ Receiving a specific written plan on how to improve my grade from the teaching staff
- ☐ Meeting with other students that are also having problems in this unit to form a study group
- ☐ Talking with a student counsellor/support services about how to work through my problems
- ☐ Attending a workshop/seminar with other students to go over improvement strategies
- ☐ Getting an email/letter about how I am doing in a class is enough
- ☐ Getting a phone call from the teaching staff to help me work through my options
- ☐ Actively participating in discussion forums to get information from the teaching staff and other students on how to improve
- ☐ Manage myself
- ☐ Other If OTHER, please specify. \_\_\_\_\_

2.5 If you were asked for permission for your data in iLearn, or other academic data held by university, to be used to identify and send early alerts about your performance, would you:

- ☐ Agree
- ☐ Disagree
- ☐ Not sure

2.6 If you were asked for permission to access your demographic and academic background to support your learning, would you:

- ☐ Agree
- ☐ Disagree
- ☐ Not sure

### Section III: Unit Specific Information

3.1 This semester, I am studying \_\_\_\_\_ unit(s).

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5

3.2 I am doing this unit for the first time.

- ☐ Yes
- ☐ No

3.3 I have read the Unit Guide.

- ☐ Yes
- ☐ No If NO, please provide a reason. \_\_\_\_\_

3.4 I understand the unit requirements.

- ☐ Completely
- ☐ Partially
- ☐ Not at all

3.5 I have the following skills/ability to undertake this unit. Rate yourself on each of the following traits on a scale of 1 (not competent), 2 (somewhat competent), 3 (uncertain), 4 (competent) and 5 (highly competent)? (Mark one in each row)

	1	2	3	4	5
Academic ability					
Competitiveness					
Computer skills					
Problem solving skills					
Critical thinking skills					
Ability to manage my time effectively					
Interpersonal skills					

3.6 I feel well prepared to undertake this unit.

- ☐ Not at all
- ☐ Very little
- ☐ Fairly well
- ☐ Quite well
- ☐ Very well
- ☐ Unsure

3.7 How would you rate your motivation in this unit, on a scale of 1 (not true), 2 (slightly true), 3 (moderately true), 4 (mostly true) and 5 (very true)? (Mark one in each row)

	1	2	3	4	5
I am motivated to do my required work in this unit					
I feel confident that I will do well in this unit					
I have to work too hard to succeed in this unit					
To accomplish my goals, it is important that I do well in this unit					
I persist even when an assessment task is challenging for me					

3.8 Which of the following factors, if any, impeded your academic performance in this unit? (Mark all that applies)

- ☐ Family responsibility/commitments
- ☐ Mental health
- ☐ Emotional health (lack of motivation, fear of failure etc.)
- ☐ Physical or health disability
- ☐ Financial issues
- ☐ Felt under-prepared for this unit
- ☐ Issue with the teaching staff
- ☐ Lack of student academic support
- ☐ Religious commitments/activities
- ☐ Social coping skills
- ☐ Problems with daily travel
- ☐ Paid work commitments
- ☐ Other If OTHER, please specify. \_\_\_\_\_

3.9 Were you contacted by a teaching or student support staff at any stage about your academic performance in this unit?

- ☐ Yes
- ☐ No

If No is selected, then skip to the end of survey...Is there anything else you would like us to know?

3.10 Did you follow-up or take any action as a result of being contacted?

- ☐ Yes
- ☐ No

If No is selected, then skip to 3.12 what was your attitude towards...

3.11 What specific action(s) did you take when you were first contacted? (Mark all that applies)

- ☐ Set an appointment for in-person meeting with my teaching staff
- ☐ Emailed teaching staff and asked for more information on what to do
- ☐ Ignored the message
- ☐ Telephoned unit convenor as a result of receiving notification
- ☐ Got attentive and started to work seriously
- ☐ Other If OTHER, please specify. \_\_\_\_\_

3.12 What was your attitude towards being contacted? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)? (Mark one in each row)

	1	2	3	4	5
I was glad to speak to my teaching staff about my situation					
I appreciated that there was someone watching out for me					
I was grateful that somebody contacted me about my academic standing in this unit					

Please specify, if there are OTHER attitude(s) towards being contacted?

\_\_\_\_\_

3.13 Did receiving an email from your unit convenor change how you studied for this unit? If so, please provide details. What did you change or do differently? (Mark all that applies)

- ☐ It made me start to engage more with the readings and/or forums
- ☐ It made me complete missing assignments and/or quizzes
- ☐ It made me realise that I needed to get help in the unit
- ☐ It made me want to give up
- ☐ Other If OTHER, please specify. \_\_\_\_\_

3.14 What impact did receiving an email from your unit convenor have on your motivation to continue in the unit? (Mark all that applies)

- ☐ It made me feel better
- ☐ It made me feel worse
- ☐ It made me feel like I could improve
- ☐ Other If OTHER, please specify. \_\_\_\_\_

Please explain why you felt this way. \_\_\_\_\_

3.15 What impact did receiving an email have on how you viewed your unit convenor? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)? (Mark one in each row)

	1	2	3	4	5
It made me feel like the unit convenor was supporting me to do well					
It made me feel like the unit convenor was concerned about me					
It made me feel like the unit convenor was interested in what I did in the unit					
It made the unit feel more personal					

Please specify, what OTHER impact, receiving an email had on how you viewed your unit convenor? \_\_\_\_\_

3.16 In future, would you want to receive similar emails in all the units that you were enrolled in?

- ☐ Yes  
☐ No  
☐ Not sure

Please tell us the reason why made the selection you did. \_\_\_\_\_

3.17 Do you think that receiving emails like this helped you to learn and do better in your unit? (Mark all that applies)

- ☐ The email did help me to improve my study habits  
☐ The email did help me to realise I was falling behind  
☐ The email did help me by suggesting resources or help that I was not aware of  
☐ The email did help me by telling me what I could do to improve my results in the unit  
☐ Other If OTHER, please specify. \_\_\_\_\_

3.18 Now that you have received email(s) from your unit convenor, what would be the impact on you if you no longer received emails in other units?

- ☐ It would impact on me because I feel that I would not do as well in future if I did not receive emails such as I received  
☐ I think there would be no impact on how well I do  
☐ Other If OTHER, please specify. \_\_\_\_\_

3.19 Were you advised to seek help from any teaching or student support services?

- ☐ Yes  
☐ No

If No is selected, then skip to the 3.21... When you were contacted, were you provided with information about campus student support services that you did not previously know about?

3.20 Which student support services from the campus wellbeing were you advised to visit? (Mark all that applies)

- ☐ Financial aid services
- ☐ Disability service
- ☐ Counselling service
- ☐ Welfare service
- ☐ Chaplaincy service
- ☐ Numeracy centre
- ☐ Health and wellbeing service
- ☐ Learning skills program
- ☐ Career & Employment service
- ☐ Education services for overseas students (ESOS)
- ☐ Academic Advice
- ☐ Tech Help
- ☐ Ask.edu.au
- ☐ Other If OTHER, please specify. \_\_\_\_\_

3.21 When you were contacted, were you provided with information about campus student support services that you did not previously know about?

- ☐ Yes
- ☐ No

3.22 What is your attitude towards campus wellbeing services relevant to this unit? (Mark all that applies)

- ☐ The hours of operation for the student support services were convenient
- ☐ Student support services were available to help me
- ☐ Student support services provided me with the accurate information
- ☐ Student support services were able to help resolve my issue(s)
- ☐ Other If OTHER, please specify. \_\_\_\_\_

3.23 Which actions(s) were you advised to take? (Mark all that applies)

- ☐ Speak with the teaching staff
- ☐ Attend lecture(s)
- ☐ Attend tutorial, mixed class, workshop or practical
- ☐ Listen to online lectures
- ☐ Complete missing/late work (assignments, diagnostic quiz, mid-semester exam, weekly submissions)
- ☐ Get external coaching
- ☐ Withdraw from the unit
- ☐ Apply for special consideration
- ☐ Other If OTHER, please specify. \_\_\_\_\_

3.24 Which actions(s) did you take? (Mark all that applies)

- ☐ Speak with the teaching staff
- ☐ Attend lecture(s)
- ☐ Attend tutorial, mixed class, workshop or practical
- ☐ Listen to online lectures
- ☐ Complete missing/late work (assignments, diagnostic quiz, mid-semester exam, weekly submissions)
- ☐ Get external coaching
- ☐ Withdraw from the unit
- ☐ Apply for special consideration
- ☐ I did not take any action
- ☐ Other If OTHER, please specify. \_\_\_\_\_

3.25 What is your attitude toward interventions and academic standing in this unit? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)? (Mark one in each row)

	1	2	3	4	5
I feel better prepared to deal with my academic situation					
I feel more comfortable now to seek academic assistance during the semester					
Now I know where to seek help for my academic studies					
I believe that student support services help					

3.26 Please indicate how you felt about how you were doing in the unit after being contacted by email? \_\_\_\_\_

3.27 Overall, how satisfied are you with the contact you received from the teaching or student support staff about your progress?

- ☐ Completely dissatisfied
- ☐ Dissatisfied
- ☐ Neutral
- ☐ Satisfied
- ☐ Completely satisfied

#### Section IV: Other Considerations

Is there anything else you would like us to know?

- ☐ Yes \_\_\_\_\_
- ☐ No

### FINAL STUDY (CASE STUDY-4) UNIT-WISE DEMOGRAPHICS

S #	Unit Code	N	Gender			Age					First Language		Ethnicity		
			Male	Female	Don't identify as M/F	18 or younger	19-24	25-34	35-49	50 or older	English	Other than English	Internati onal	Aboriginal or Torres Islander	Local
FoSE	ENGG1XX	47	42 (89.4%)	5 (10.6%)	-	13 (27.7%)	33 (70.2%)	1 (2.1%)	-	-	36 (76.6%)	11 (23.4%)	6 (12.8%)	1 (2.1%)	40 (85.1%)
	ISYS1XX	75	55 (73.3%)	18 (24%)	2 (2.7%)	26 (34.7%)	45 (60%)	4 (5.3%)	-	-	63 (84%)	12 (16%)	1 (1.3%)	2 (2.7%)	72 (96%)
	ISYS3XX	18	14 (77.8%)	4 (22.2%)	-	-	16 (88.9%)	2 (11.1%)	-	-	13 (72.2%)	5 (27.8%)	3 (16.7%)	-	15 (83.3%)
	MECH2XA	8	7 (87.5%)	1 (12.5%)	-	-	8 (100%)	-	-	-	6 (75%)	2 (25%)	1 (12.5%)	-	7 (87.5%)
	MECH2XB	10	9 (90%)	1 (10%)	-	-	9 (90%)	1 (10%)	-	-	8 (80%)	2 (20%)	2 (20%)	-	8 (80%)
	MECH2XC	8	7 (87.5%)	1 (12.5%)	-	-	7 (87.5%)	1 (12.5%)	-	-	4 (50%)	4 (50%)	2 (25%)	1 (12.5%)	5 (62.5%)
	MECH2XD	11	10 (90.9%)	1 (9.1%)	-	-	10 (90.9%)	1 (9.1%)	-	-	9 (81.8%)	2 (18.2%)	3 (27.3%)	-	8 (72.7%)
	PHYS2XX	9	7 (77.8%)	2 (22.2%)	-	-	6 (66.7%)	2 (22.2%)	1 (11.1%)	-	8 (88.9%)	1 (11.1%)	-	-	9 (100%)
	<b>Total</b>	<b>186</b>	<b>151</b>	<b>33</b>	<b>2</b>	<b>39</b>	<b>134</b>	<b>12</b>	<b>1</b>	<b>0</b>	<b>147</b>	<b>39</b>	<b>18</b>	<b>4</b>	<b>164</b>

FoBE	ACCG1XX	25	16 (64%)	9 (36%)	-	10 (40%)	15 (60%)	-	-	-	17 (68%)	8 (32%)	4 (16%)	-	21 (84%)
	ACCG2XX	16	7 (43.8%)	9 (56.3%)	-	-	13 (81.3%)	2 (12.5%)	1 (6.3%)	-	6 (37.5%)	10 (62.5%)	8 (50%)	-	8 (50%)
	ACST1XX	111	46 (41.4%)	65 (58.6%)	-	29 (26.1%)	79 (71.2%)	3 (2.7%)	-	-	78 (70.3%)	33 (29.7%)	17 (15.3%)	-	94 (84.7%)
	AFIN2XX	41	15 (36.6%)	26 (63.4%)	-	-	36 (87.8%)	4 (9.8%)	-	1 (2.4%)	20 (48.8%)	21 (51.2%)	20 (48.8%)	-	21 (51.2%)
	ECON1XA	40	20 (50%)	20 (50%)	-	11 (27.5%)	28 (70%)	1 (2.5%)	-	-	27 (67.5%)	13 (32.5%)	6 (15%)	-	34 (85%)
	ECON1XB	64	33 (51.6%)	30 (46.9%)	1 (1.6%)	25 (39.1%)	38 (59.4%)	-	1 (1.6%)	-	43 (67.2%)	21 (32.8%)	6 (9.4%)	-	58 (90.6%)
	<b>Total</b>	<b>297</b>	<b>137</b>	<b>159</b>	<b>1</b>	<b>75</b>	<b>209</b>	<b>10</b>	<b>2</b>	<b>1</b>	<b>191</b>	<b>106</b>	<b>61</b>	<b>0</b>	<b>236</b>
FoA	AHIS1XX	111	34 (30.6%)	77 (69.4%)	-	33 (29.7%)	67 (60.4%)	7 (6.3%)	2 (1.8%)	2 (1.8%)	98 (88.3%)	13 (11.7%)	3 (2.7%)	1 (0.9%)	107 (96.4%)
	EUL1XX	39	10 (25.6%)	29 (74.4%)	-	8 (20.5%)	29 (74.4%)	1 (2.6%)	1 (2.6%)	-	33 (84.6%)	6 (15.4%)	3 (7.7%)	-	36 (92.3%)
	<b>Total</b>	<b>150</b>	<b>44</b>	<b>106</b>	<b>0</b>	<b>41</b>	<b>96</b>	<b>8</b>	<b>3</b>	<b>2</b>	<b>131</b>	<b>19</b>	<b>6</b>	<b>1</b>	<b>143</b>
FoHS	ACBE1XX	6	2 (33.3%)	4 (66.7%)	-	2 (33.3%)	4 (66.7%)	-	-	-	5 (83.3%)	1 (16.7%)	-	-	6 (100%)
	<b>Total</b>	<b>6</b>	<b>2</b>	<b>4</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>6</b>

S #	Unit Code	N	Student Status				Enrolment Status		Employment Status (hours)					
			FYFS	FYSS	Continu-ing	Came from other Uni	Full-time	Part-time	<5	5-10	11-15	16-20	>20	Not working
FoSE	ENGG1XX	47	3 (6.4%)	34 (72.3%)	10 (21.3%)	1 (2.1%)	46 (97.9%)	1 (2.1%)	5 (10.6%)	6 (12.8%)	9 (19.1%)	7 (14.9%)	4 (8.5%)	16 (34%)
	ISYS1XX	75	9 (12%)	43 (57.3%)	22 (29.3%)	2 (2.7%)	68 (90.7%)	7 (9.3%)	3 (4%)	11 (14.7%)	8 (10.7%)	8 (10.7%)	12 (16%)	33 (44%)
	ISYS3XX	18	-	-	18 (100%)	-	14 (77.8%)	4 (22.2%)	1 (5.6%)	6 (33.3%)	3 (16.7%)	4 (22.2%)	2 (11.1%)	2 (11.1%)
	MECH2XA	8	-	-	8 (100%)	-	8 (100%)	-	1 (12.5%)	2 (25%)	1 (12.5%)	3 (37.5%)	-	1 (12.5%)
	MECH2XB	10	-	1 (10%)	9 (90%)	2 (20%)	10 (100%)	-	3 (30%)	-	2 (20%)	4 (40%)	1 (10%)	-
	MECH2XC	8	-	-	8 (100%)	-	8 (100%)	-	1 (12.5%)	1 (12.5%)	2 (25%)	2 (25%)	-	2 (25%)
	MECH2XD	11	-	-	11 (100%)	-	9 (81.8%)	2 (18.2%)	2 (18.2%)	2 (18.2%)	2 (18.2%)	4 (36.4%)	-	1 (9.1%)
	PHYS2XX	9	-	1 (11.1%)	8 (88.9%)	-	9 (100%)	-	-	2 (22.2%)	3 (33.3%)	2 (22.2%)	2 (22.2%)	-
	<b>Total</b>	<b>186</b>	<b>12</b>	<b>79</b>	<b>94</b>	<b>5</b>	<b>172</b>	<b>14</b>	<b>16</b>	<b>30</b>	<b>30</b>	<b>34</b>	<b>21</b>	<b>55</b>
FoBE	ACCG1XX	25	10 (40%)	13 (52%)	3 (12%)	-	24 (96%)	1 (4%)	2 (8%)	2 (8%)	7 (28%)	2 (8%)	4 (16%)	8 (32%)
	ACCG2XX	16	10 (40%)	13 (52%)	3 (12%)	-	16 (100%)	-	1 (6.3%)	2 (12.5%)	3 (18.8%)	1 (6.3%)	2 (12.5%)	7 (43.8%)
	ACST1XX	111	20 (18%)	61 (55%)	30 (27%)	17 (15.3%)	105 (94.6%)	6 (5.4%)	5 (4.5%)	19 (17.1%)	14 (12.6%)	17 (15.3%)	25 (22.5%)	31 (27.9%)

	AFIN2XX	41	2 (4.9%)	3 (7.3%)	36 (87.8%)	2 (4.9%)	38 (92.7%)	3 (7.3%)	7 (17.1%)	3 (7.3%)	10 (24.4%)	8 (19.5%)	5 (12.2%)	8 (19.5%)
	ECON1XA	40	6 (15%)	23 (57.5%)	11 (27.5%)	2 (5%)	36 (90%)	4 (10%)	4 (10%)	9 (22.2%)	2 (5%)	13 (32.5%)	4 (10%)	8 (20%)
	ECON1XB	64	9 (14.1%)	38 (59.4%)	13 (20.3%)	5 (7.8%)	61 (95.3%)	3 (4.7%)	7 (10.9%)	7 (10.9%)	10 (15.6%)	11 (17.2%)	12 (18.8%)	17 (26.6%)
	<b>Total</b>	<b>297</b>	<b>57</b>	<b>151</b>	<b>96</b>	<b>26</b>	<b>280</b>	<b>17</b>	<b>26</b>	<b>42</b>	<b>46</b>	<b>52</b>	<b>52</b>	<b>79</b>
FoA	AHIS1XX	111	15 (13.5%)	78 (70.3%)	18 (16.2%)	8 (7.2%)	98 (88.3%)	13 (11.7%)	9 (8.1%)	18 (16.2%)	19 (17.1%)	16 (14.4%)	20 (18%)	29 (26.1%)
	EUL1XX	39	3 (7.7%)	24 (61.5%)	13 (33.3%)	5 (12.8%)	38 (97.4%)	1 (2.6%)	1 (2.6%)	3 (7.7%)	12 (30.8%)	5 (12.8%)	7 (17.9%)	11 (28.2%)
	<b>Total</b>	<b>150</b>	<b>18</b>	<b>102</b>	<b>31</b>	<b>13</b>	<b>136</b>	<b>14</b>	<b>10</b>	<b>21</b>	<b>31</b>	<b>21</b>	<b>27</b>	<b>40</b>
FoHS	ACBE1XX	6	-	2 (33.3%)	3 (50%)	1 (16.7%)	6 (100%)	-	1 (16.7%)	5 (83.3%)	-	-	-	-
	<b>Total</b>	<b>6</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## FINAL STUDY (CASE STUDY-4)

### INPUT VARIABLES FOR DECISION TREE ANALYSIS

Survey Question	Variable Name for analysis	Possible answers in the survey
Gender	gender	- Male - Female - I don't identify as male or female
Age (in years) *	age	- 18 or younger - 19-24 - 25-34 - 35-49 - 50 or older - Prefer not to say
On average, approximately how many hours did you spend per week on employment?	employment	- < 5 - 5 - 10 - 11 - 15 - 16 - 20 - > 20 - Not working
In the future, would you like to be contacted if your performance in a unit is unsatisfactory?	LikeToBeContacted	- Yes - No
I feel well prepared to undertake this unit.	Preparedness	- Not at all - Very little - Fairly well - Quite well - Very well - Unsure
What impact did receiving an email have on how you viewed your unit convenor? Please mark on a scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree)? (InterventionImpactUC)	InterventionImpactUC_Supporting	- It made me feel like the unit convenor was supporting me to do well
	InterventionImpactUC_Concerned	- It made me feel like the unit convenor was concerned about me
	InterventionImpactUC_Interested	- It made me feel like the unit convenor was interested in what I did in the unit
	InterventionImpactUC_Personal	- It made the unit feel more personal
Which student support services from the campus wellbeing were you advised to visit? (Mark all that applies)	Recoded_NumberOfUtilisedStudentSupportServices	- Financial aid services - Disability service - Counselling service - Welfare service - Chaplaincy service - Numeracy centre - Health and wellbeing service - Learning skills program - Career & Employment service - Education services for overseas students (ESOS) - Academic Advice - Tech Help - Ask.edu.au
What is your attitude towards campus wellbeing services relevant to this unit? (Mark all that applies)	AttitudeToSupportServices_HoursOfOperation	- The hours of operation for the student support services were convenient
	AttitudeToSupportServices_HelpAvailable	- Student support services were available to help me
	AttitudeToSupportServices_ProvidedAccurateInfo	- Student support services provided me with the accurate information
	AttitudeToSupportServices_ResolveIssues	- Student support services were able to help resolve my issue(s)

Did you follow-up or take any action as a result of being contacted?	Recorded_FollowedUp	- Yes - No
What specific action(s) did you take when you were first contacted? (Mark all that applies)	ActionStudentTook_SetAppt	- Set an appointment for in-person meeting with my teaching staff
	ActionStudentTook_Emailed	- Emailed teaching staff and asked for more information on what to do
	ActionStudentTook_IgnoredMsg	- Ignored the message
	ActionStudentTook_GotAttentive	- Got attentive and started to work seriously
	ActionStudentTook_TelephonedUnitConvenor	- Telephoned unit convenor as a result of receiving notification
Which actions(s) were you advised to take? (Mark all that applies)	ActionAdvised_ContactTeachingStaff	- Speak with the teaching staff
	ActionAdvised_AttendTutorial	- Attend tutorial or practical
	ActionAdvised_AttendLecture	- Attend lecture(s)
	ActionAdvised_OnlineLecture	- Listen to online lectures
	ActionAdvised_CompleteAssessment	- Complete missing/late work (assignments, diagnostic quiz, mid-semester exam, weekly submissions)
	ActionAdvised_Coaching	- Get external coaching
	ActionAdvised_Withdraw	- Withdraw from the unit
	ActionAdvised_SpecialConsideration	- Apply for special consideration
Which actions(s) did you take? (Mark all that applies)	ActionsTook_ContactTeachingStaff	- Speak with the teaching staff
	ActionsTook_AttendTutorial	- Attend tutorial or practical
	ActionsTook_AttendLecture	- Attend lecture(s)
	ActionsTook_OnlineLecture	- Listen to online lectures
	ActionsTook_CompleteAssessment	- Complete missing/late work (assignments, diagnostic quiz, mid-semester exam, weekly submissions)
	ActionsTook_Nothing	- I did not take any action
	ActionsTook_Coaching	- Get external coaching
	ActionsTook_Withdraw	- Withdraw from the unit
	ActionsTook_SpecialConsideration	- Apply for special consideration
Did receiving an email from your unit convenor change how you studied for this unit? (Mark all that applies)	InterventionImpactStudy_Engagement	- It made me start to engage more with the readings and/or forums
	InterventionImpactStudy_CompleteAssessments	- It made me complete missing assignments and/or quizzes
	InterventionImpactStudy_GetHelp	- It made me realise that I needed to get help in the unit
	InterventionImpactStudy_GiveUp	- It made me want to give up
	InterventionImpactPerformance_StudyHabits	- The email did help me to improve my study habits

Do you think that receiving emails like this helped you to learn and do better in your unit? (Mark all that applies)	InterventionImpactPerformance_FallingBehind	- The email did help me to realise I was falling behind
	InterventionImpactPerformance_SuggestResources	- The email did help me by suggesting resources or help that I was not aware of
	InterventionImpactPerformance_ImproveResults	- The email did help me by telling me what I could do to improve my results in the unit
Now that you have received email(s) from your unit convenor, what would be the impact on you if you no longer received emails in other units?	InterventionImpact_NotInOtherUnits	- It would impact on me because I feel that I would not do as well in future if I did not receive emails such as I received - I think there would be no impact on how well I do

\* For each variable, students were allowed to choose an option from the provided scales or yes/no

## RELIABILITIES (MEAN, STANDARD DEVIATION AND CRONBACH ALPHA) OF CASE STUDIES 1-4 INCLUDING PILOT

S#	Factors (Items)	Pilot(Initial)				Pilot(Follow-up)				Case Study-1(Initial)				Case Study-1(Follow-up)				Case Study-2 (FoSE) Mean of All				Case Study-3					Case Study-4					
		Q#	N	Mea n	SD	Cronbach Alpha	Q#	N	Mea n	SD	Cronbach Alpha	Q#	N	Mea n	SD	Cronbach Alpha	Q#	N	Mea n	SD	Cronbach Alpha	Q#	N	Mea n	SD	Cronbach Alpha	Q#	N	Mea n	SD	Cronbach Alpha	
1	Skills/abilities to undertake the unit (8)	15									15						17					Text					Text					
	Academic ability	23	3.65	0.78	0.787						43	3.77	0.75	0.721			66	3.98	0.748	0.788		999	3.83	0.763	0.818		595	3.89	0.77	0.809		
	Competitiveness	23	3.57	0.84							43	3.65	0.95				66	3.49	0.885			999	3.53	0.928				595	3.58		0.98	
	Computer skills	23	3.96	0.71							43	3.79	1.13				66	3.90	0.818			999	3.89	0.909				595	3.98		0.91	
	Problem solving skills	23	4.17	0.78							43	3.98	0.8				66	4.06	0.731			999	3.81	0.766				595	3.90		0.76	
	Programming ability	23	3.09	1.08							43	2.79	1.17				66	3.26	1.000			999	2.90	1.062				595	2.90		1.062	
	Critical thinking skills	23	4.13	0.76							43	3.91	0.750				66	3.92	0.694			999	3.74	0.791				595	3.77		0.80	
	Ability to manage my time effectively	23	3.65	1.03							43	3.49	1.24				66	3.19	1.093			999	3.44	1.049				595	3.27		1.06	
	Interpersonal skills	23	3.96	0.71							43	3.79	0.940				66	3.42	0.992			999	3.84	0.905				595	3.75		0.91	
2	Motivation in the unit (5)	19									19						21				Text					Text						
	I am motivated to do my required work in this unit	25	3.88	0.78	0.779						43	3.79	1.081	0.532			66	3.49	0.908	0.732		998	3.94	0.97	0.59		595	3.60	1.00	0.637		
	I feel confident that I will do well in this unit	25	3.84	0.800							43	3.28	1.008				66	3.52	0.758			998	3.43	0.92				595	3.48		0.97	
	I have to work too hard to succeed in this unit	25	3	1.16							43	3.35	1.307				66	3.14	0.904			998	3.39	1.14				595	3.14		1.17	
	To accomplish my goals, it is important that I do well in this unit	25	3.8	1.12							43	4.12	0.851				66	3.91	0.970			998	4.12	0.87				595	3.82		1.05	
	I persist even when an assessment task is challenging for me	25	3.76	0.93							43	4.26	0.790				66	3.93	0.903			998	4.13	0.84				595	4.01		0.87	
3	Expectations of the undertaking Unit (3)	25									24						23				Text											
	Easy	25	3.8	1.3	0.983						39	2.9	0.91	0.705			66	2.82	0.66	0.364		632	2.37	0.93	0.484	Not asked						
	Minimal course work	25	3.6	1.67							39	2.85	0.93				66	2.68	0.71			632	2.28	0.91								
	To be contacted regularly with academic support	25	3.2	1.1							39	2.95	1.12				66	2.97	1.08			632	3.58	0.86								
4	Expectations from the teaching staff (3)	26									25						24				Text											
	Quality of teaching is high	25	4.12	0.73	0.938						39	3.82	1.07	0.915			67	3.93	0.67	0.82		649	4.15	0.80	0.83	Not asked						
	Teaching staff are approachable	25	4.16	0.75							39	3.85	1.040				67	3.99	0.70			649	4.11	0.85								
	Teaching staff are usually available to discuss my work and give helpful feedback	25	4.08	0.81							39	3.72	1.1				67	3.84	0.82			649	3.88	0.90								
5	Attitude towards being contacted via an early alert (3)					5									35						Text					Text						
	I was glad to speak to my unit teacher about my situation				0.938		5	3.2	1.1	0.938				Only 1 response so cannot calculate reliability			Not asked as NO interventions were done				0.876		51	3.69	1.17	0.876		86	3.80	1.09	0.865	
	I appreciated that there was someone watching out for me						5	4	1.23								51	3.98	0.97				86	4.14	1.01							
	I was grateful that somebody contacted me about my academic standing in this unit						5	4	1.23								51	3.94	0.99				86	4.14	1.02							
6	Attitude towards intervention and academic standing in the unit (4)					19									49						Text					Text						
	I feel better prepared to deal with my academic situation				0.872		5	2.8	1.79	0.872				Only 1 response so cannot calculate reliability			Not asked as NO interventions were done				0.902		51	3.49	0.92	0.902		80	3.69	0.95	0.883	
	Now I know where to seek help for my academic studies						5	3.2	1.3								51	3.61	0.96				80	3.49	1.02							
	I believe that student support services help						5	3.6	1.14								51	3.61	0.96				80	3.49	0.99							
	I feel more comfortable now to seek academic assistance during the semester																						80	3.51	0.97							
7	Intervention Impact on how the student view the unit convenor (4)																								Text							
	It made me feel like the unit convenor was supporting me to do well				Not asked																						84	4.23	0.73	0.85		
	It made me feel like the unit convenor was concerned about me																										84	4.11	0.74			
	It made me feel like the unit convenor was interested in what I did in the unit																										84	4.13	0.76			
	It made the unit feel more personal																										84	3.98	0.81			
	Yellow=excluded item																															
	Green=included item																															

## APPENDIX F

### COMPARISON OF CASE STUDIES 1-4 INCLUDING PILOT

		Pilot	Case Study-1	Case Study-2	Case Study-3	Case Study-4
Time Period		Session 3 (Dec 2013-Jan 2014)	Session 1 (March 2014-July 2014)	Session 1 (May 2014-July 2014)	Session 1 (March 2015-June 2015)	Session 2 (Aug 2015-Nov 2015)
Description		<p>Specific Purpose: Test the initial survey. Initial and Follow-up surveys sent. Alerts were sent under a pseudonym 'computing study buddy'.</p>	<p>Specific Purpose: Validation of revised survey and data capture from more than one unit. Identify at-risk students according to the triggers specified by the unit convenors and send interventions to identified students. Initial and Follow-up surveys sent. Alerts were sent under a pseudonym 'computing study buddy'.</p>	<p>Specific Purpose: To widen the distribution of the survey, specifically targeting high-risk units in the Faculty of Science and Engineering (FoSE). Study was requested by the FoSE Academic Standards and Quality Committee to determine value of early alerts in future offerings of the units. Only the Initial survey was sent at the end of the semester. No interventions were done.</p>	<p>Specific Purpose: Institution-wide distribution of the survey and utilisation of MEAP in units that met the unit participation criteria (i.e. large enrolments, online activities in iLearn and high failure rates in the last study period). To use and test the Moodle Engagement Analytics Plugin to generate an engagement report to identify the students at-risk. Note: students were identified as 'at-risk' via MEAP+. The email addresses were used to send alerts within the LMS.</p>	<p>Specific Purpose: Institution-wide distribution of the survey and utilisation of MEAP+ in units that met the unit participation criteria. To test the extended version of the MEAP+ prototype to identify students at-risk and send alerts and interventions to students using the mailer component. To increase the response rates to our online survey an incentive (prize draw) was added to facilitate survey recruitment and motivate</p>

					Initial and Follow-up surveys were sent.	participants who might otherwise not respond. A single survey combining Initial and Follow-up questions was sent at the end of the semester.
<b># of Units</b>		1	2	3	13	17
<b>Unit-Participants</b>		ISYS1XX-39 students	ISYS1XX-367 students COMP1XX-64 students	All students (810) enrolled in units COMP1XX, MATH1XX & PHYS1XX	4,800 students enrolled in 13 participating units	7,035 students enrolled in 17 participating units
<b>Respondents</b>		Initial=27 Follow-up=12 Received alerts=6	ISYS1XX (40) Initial=40 Follow-up=21 Received alerts=11 COMP1XX Initial=5 Follow-up=0 Received alerts=13	85	1113 (from 12 units as there was no response from 1 unit)	Valid responses=639  Respondents =607

Item	Response Options	Pilot	Case Study-1	Case Study-2	Case Study-3	Case Study-4
Student ID (CHESSN)	Enter 8-digit					
The unit code for which I am filling in this survey is:	Dropdown list of units	A link was put up in the news forum on the unit iLearn page	A link was put up in the unit iLearn page	A link was put up in the unit iLearn page	A link was put up in the unit iLearn page	A link was put up in the unit iLearn page
Gender	<ul style="list-style-type: none"> <li>Male</li> <li>Female</li> <li>I don't identify as male or female</li> </ul>	Male-16, 64% Female-9, 36%	<u>ISYS1XX:</u> Male-24, 60% Female-16, 40% <u>COMP1XX:</u> Male-4, 80% Female-1, 20%	Male-55, 64.7% Female-28, 32.9% I don't identify as male or female-2, 2.4%	Male-330, 30.2% Female-753, 68.9% I don't identify as male or female-10, 0.9%	Male-334, 52.3% Female-302, 47.3% I don't identify as male or female-3, 0.5%
Age (in years)	<ul style="list-style-type: none"> <li>18 or younger</li> <li>19-24</li> <li>25-34</li> <li>35-49</li> <li>50 or older</li> <li>Prefer not to say</li> </ul>	19-24, 21, 80.8% 25-34, 5, 19.2%	<u>ISYS1XX:</u> 18 or younger, 14, 35% 19-24, 22, 55% 25-34, 4, 10% <u>COMP1XX:</u> 19-24, 5, 100%	18 or younger, 27, 31.7% 19-24, 48, 56.4% 25-34, 6, 7.3% 35-49, 1, 1.1% 50 or older, 3, 3.5%	18 or younger, 473, 42.6% 19-24, 482, 43.4% 25-34, 83, 7.5% 35-49, 48, 4.3% 50 or older, 24, 2.2% Prefer not to say, 1, 0.1%	18 or younger, 157, 24.6% 19-24, 443, 69.3% 25-34, 30, 4.7% 35-49, 6, 0.9% 50 or older, 3, 0.5%
My first language is:	<ul style="list-style-type: none"> <li>English</li> <li>Other than English</li> </ul>	-English, 11, 42.3% -Other than English, 15, 57.7%	<u>ISYS1XX:</u> -English, 29, 72.5% -Other than English, 11, 27.5% <u>COMP1XX:</u>	-English, 67, 78.8% -Other than English, 18, 21.2%	-English, 926, 83.6% -Other than English, 182, 16.4%	-English, 474, 74.2% -Other than English, 165, 25.8%

			-English, 2, 40% -Other than English, 3, 60%			
Ethnicity I am an/a:	<ul style="list-style-type: none"> <li>International Student</li> <li>Aboriginal/Torres Strait Islander Student</li> <li>Neither</li> </ul>	-International Student, 8, 32% -Neither, 17, 68%	<u>ISYS1XX:</u> -International Student, 6, 15% -Aboriginal /Torres Strait Islander Student, 3, 7.5% -Neither, 28, 70% Missing, 3, 7.5% <u>COMPIXX:</u> -International Student, 1, 20% -Neither, 4, 80%	-International Student, 4, 4.7% -Aboriginal /Torres Strait Islander Student, 2, 2.4% -Neither, 79, 92.9%	-International Student, 76, 6.9% -Aboriginal /Torres Strait Islander Student, 9, 0.8% -Neither, 1023, 92.3%	-International Student, 85, 13.3% -Aboriginal /Torres Strait Islander Student, 5, 0.8% -Neither, 549, 85.9%
My student enrolment by course load is:	<ul style="list-style-type: none"> <li>Full-time</li> <li>Part-time</li> </ul>	Enrolment Status was not asked in pilot	Enrolment Status was not asked in this case study	Enrolment Status was not asked in this case study	Enrolment Status was not asked in this case study	Full-time, 594, 93.0% Part-time, 45, 7.0%
My student status is:	Pilot/CS-1/CS-2/CS-3 Not a multiple response question <ul style="list-style-type: none"> <li>First year, first semester student (in year)</li> <li>I came from another university (in year)</li> </ul>	-1 <sup>st</sup> year, 1 <sup>st</sup> semester student, 1, 3.8% -2 <sup>nd</sup> year student, 12, 46.2% -3 <sup>rd</sup> year student, 11, 42.3% -Other, 2, 7.7%	<u>ISYS1XX:</u> -1 <sup>st</sup> year, 1 <sup>st</sup> semester student, 24, 60% -I came from another university, 3, 7.5% -1 <sup>st</sup> year, 2 <sup>nd</sup> semester student, 2, 5%	-1 <sup>st</sup> year, 1 <sup>st</sup> semester student, 50, 58.8% -I came from another university, 7, 8.2% -1 <sup>st</sup> year, 2 <sup>nd</sup> semester student, 4, 4.7%	-1 <sup>st</sup> year, 1 <sup>st</sup> semester student, 690, 62% -I came from another university, 46, 4.1% -1 <sup>st</sup> year, 2 <sup>nd</sup> semester student, 55, 4.9%	-1 <sup>st</sup> year, 1 <sup>st</sup> semester student, 77, 12.1% -1 <sup>st</sup> year, 2 <sup>nd</sup> semester student, 321, 50.2% -Continuing student (2 <sup>nd</sup> year, 3 <sup>rd</sup> year or

	<ul style="list-style-type: none"> <li>• First year student, second semester student (in year)</li> <li>• 2<sup>nd</sup> year student</li> <li>• 3<sup>rd</sup> year student</li> <li>• Other</li> </ul> <p>CS-4/CS-5 (Mark all that applies)</p> <ul style="list-style-type: none"> <li>• First year, first semester student</li> <li>• First year, second semester student</li> <li>• Continuing student (2<sup>nd</sup> year, 3<sup>rd</sup> year or above)</li> <li>• I came from another university</li> <li>• Other</li> </ul>		-2 <sup>nd</sup> year student, 9, 22.5% -3 <sup>rd</sup> year student, 1, 2.5% -Other, 1, 2.5% <u>COMPIXX:</u> -1 <sup>st</sup> year, 2 <sup>nd</sup> semester student, 1, 20% -2 <sup>nd</sup> year student, 3, 60% -Other, 1, 20%	-2 <sup>nd</sup> year student, 14, 16.3% -3 <sup>rd</sup> year student, 4, 4.7% -Other, 6, 7.3%	-2 <sup>nd</sup> year student, 181, 16.3% -3 <sup>rd</sup> year student, 79, 7.1% -Other, 62, 5.6%	above), 236, 36.9% -I came from another university, 47, 7.4% -Other, 5, 0.8%
I am enrolled with the faculty of:  Pilot/CS-1/CS-2/CS-3 Not a multiple response question CS-4/CS-5 (Mark all that applies)	<ul style="list-style-type: none"> <li>• Arts</li> <li>• Business and Economics</li> <li>• Human Sciences</li> <li>• Science and Engineering</li> <li>• Medicine and Health Sciences</li> </ul>	-Arts, 1, 3.8% -Business and Economics, 15, 57.7% -Human Sciences, 1, 3.8% -Sciences, 9, 34.6%	<u>ISYS1XX:</u> -Arts, 3, 7.5% -Business and Economics, 23, 57.5% -Sciences, 14, 35% <u>COMPIXX:</u> -Business and Economics, 1, 20% -Sciences, 4, 80%	-Arts, 10, 11.8% -Business and Economics, 2, 2.4% -Science and Engineering, 72, 84.7%	Not a multiple response question -Arts, 306, 27.5% -Business and Economics, 281, 25.2% -Human Sciences, 337, 30.3% -Science and Engineering, 165, 14.8%	-Arts, 151, 23.6% -Business and Economics, 348, 54.5% -Human Sciences, 48, 7.5% -Science and Engineering, 186, 29.1%

					-Medicine and Health Sciences, 24, 2.2%	-Medicine and Health Sciences, 4, 0.6%
On average, approximately how many hours did you spend per week on employment?	<ul style="list-style-type: none"> <li>• &lt; 5</li> <li>• 5 - 10</li> <li>• 11 - 15</li> <li>• 16 – 20</li> <li>• &gt; 20</li> <li>• Not working</li> </ul>	-<5, 6, 23.1% -5-10, 1, 3.8% -11-15, 5, 19.2% -16-20, 2, 7.7% ->20, 1, 3.8% -Not working, 11, 42.3%	<u>ISYS1XX:</u> -<5, 3, 7.5% -5-10, 5, 12.5% -11-15, 5, 12.5% -16-20, 5, 12.5% ->20, 6, 15% -Not working, 16, 40% <u>COMP1XX:</u> -<5, 1, 20% -5-10, 1, 20% -11-15, 1, 20% ->20, 1, 20% -Not working, 1, 20%	-<5, 9, 11% -5-10, 16, 19% -11-15, 6, 7% -16-20, 12, 14% ->20, 13, 15% -Not working, 29, 34%	-<5, 118, 10.6% -5-10, 198, 17.8% -11-15, 186, 16.7% -16-20, 146, 13.1% ->20, 159, 14.3% -Not working, 305, 27.4%	-<5, 53, 8.3% -5-10, 98, 15.3% -11-15, 107, 16.7% -16-20, 107, 16.7% ->20, 100, 15.6% -Not working, 174, 27.2%
Do you have other responsibilities such as, a carer or similar.	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul> If Yes, please provide further details	Yes, 2, 7.7% No, 24, 92.3%	<u>ISYS1XX:</u> Yes, 5, 12.5% No, 33, 82.5% <u>COMP1XX:</u> Yes, 0 No, 5, 100%	Yes, 9, 10.7% No, 75, 89.3%	Yes, 180, 16.3% No, 925, 83.7%	Not asked in this case study...merged with factors
Do you have any physical disability or a diagnosed learning disability?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	Yes, 1, 4.3% No, 22, 95.7%	<u>ISYS1XX:</u> Yes, 2, 5.9% No, 32, 94.1% <u>COMP1XX:</u> Yes, 2, 40% No, 3, 60%	Yes, 9, 10.6% No, 76, 89.4%	Yes, 47, 4.2% No, 1065, 95.8%	Not asked in this case study...merged with factors

This semester, I am studying ____ unit(s).	1/2/3/4/5	-1, 12, 46.2% -2, 13, 50% -3, 1, 3.8%	<u>ISYS1XX:</u> -1, 1 (2.5%) -2, 4 (10%) -3, 9 (22.5%) -4, 26 (65%) <u>COMPIXX:</u> -1, 1 (20%) -2, 1 (20%) -3, 2 (40%) -4, 1 (20%)	-1, 5, 6.4% -2, 9, 11.5% -3, 16, 20.5% -4, 48, 61.5%	-1, 44, 4.4% -2, 84, 8.3% -3, 192, 19.1% -4, 682, 67.7% -5, 5, 0.5%	-1, 11, 1.8% -2, 34, 5.6% -3, 133, 22.1% -4, 410, 68.1% -5, 14, 2.3%
I am doing this unit for the first time.	<ul style="list-style-type: none"> <li>Yes</li> <li>No</li> </ul> If NO, when you did this unit (semester and year)	Yes, 24, 96% No, 1, 4%	<u>ISYS1XX:</u> Yes, 37, 94.9% No, 2, 5.1% <u>COMPIXX:</u> Yes, 4, 80% No, 1, 20%	<u>Doing 1 unit:</u> Yes, 4, 100% No, 0	Yes, 958, 95.2% No, 48, 4.8%	Yes, 561, 93.2% No, 41, 6.8%
I have any prior knowledge of this unit.	<ul style="list-style-type: none"> <li>Yes</li> <li>No</li> </ul> If YES, please specify your content knowledge	Yes, 7, 28% No, 18, 72%	<u>ISYS1XX:</u> Yes, 9, 23.1% No, 30, 76.9% <u>COMPIXX:</u> Yes, 0 No, 5, 100%	<u>Doing 1 unit:</u> Yes, 0 No, 4, 100%	Yes, 185, 18.4% No, 820, 81.6%	Not asked in this case study
I have read the Unit Guide.	<ul style="list-style-type: none"> <li>Yes</li> <li>No</li> </ul> If NO, please provide a reason	Yes, 24, 96% No, 1, 4%	<u>ISYS1XX:</u> Yes, 39, 97.5% No, 1, 2.5% <u>COMPIXX:</u> Yes, 5, 100% No, 0	<u>Doing 1 unit:</u> Yes, 4, 100% No, 0	Yes, 989, 98.3% No, 17, 1.7%	Yes, 595, 98.8% No, 7, 1.2%
I understand the unit requirements.	<ul style="list-style-type: none"> <li>Completely</li> <li>Partially</li> </ul>	Completely, 18, 72% Partially, 6, 24%	<u>ISYS1XX:</u> Completely, 18, 45%	<u>Doing 1 unit:</u> Completely, 4, 100%	Completely, 648, 64.6%	Completely, 466, 77.4%

	<ul style="list-style-type: none"> <li>Not at all</li> </ul>	Not at all, 1, 4%	Partially, 21, 52.5% <u>COMPIXX:</u> Completely, 3, 60% Partially, 2, 40%	Partially, 0	Partially, 351, 35% Not at all, 4, 0.4%	Partially, 133, 22.1% Not at all, 3, 0.5%
I have the following skills/ability to undertake this unit. -Academic ability -Competitiveness -Computer skills -Problem solving skills -Programming ability -Critical thinking skills -Ability to manage my time effectively -Interpersonal skills	Not competent (1) Somewhat competent (2) Uncertain (3) Competent (4) Highly competent (5)	-Academic ability (mean=3.56) (SD=0.821) -Competitive (mean=3.52) (SD=0.872) -Computer skills (mean=3.92) (SD=0.812) -Problem solving skills (mean=4.0) (SD=0.957) -Programming ability (mean=3.0) (SD=1.080) -Critical thinking skills (mean=4.04) (SD=0.859) -Ability to manage my time effectively	<u>ISYS1XX:</u> -Academic ability (mean=3.84) (SD=0.754) -Competitive (mean=3.74) (SD=0.921) -Computer skills (mean=3.82) (SD=1.087) -Problem solving skills (mean=4.0) (SD=0.805) -Programming ability (mean=2.71) (SD=1.183) -Critical thinking skills (mean=3.89) (SD=0.764) -Ability to manage my time effectively	<u>Doing 1 unit:</u> -Academic ability (mean=3.75) (SD=1.258) -Competitive (mean=2.75) (SD=0.957) -Computer skills (mean=3.75) (SD=0.957) -Problem solving skills (mean=3.75) (SD=0.5) -Programming ability (mean=1.67) (SD=0.577) -Critical thinking skills (mean=4.25) (SD=0.5) -Ability to manage my time effectively	-Academic ability (mean=3.83) (SD=0.767) -Competitive (mean=3.53) (SD=0.931) -Computer skills (mean=3.88) (SD=0.913) -Problem solving skills (mean=3.81) (SD=0.766) -Programming ability (mean=2.90) (SD=1.061) -Critical thinking skills (mean=3.74) (SD=0.792) -Ability to manage my time effectively	-Academic ability (mean=3.89) (SD=0.766) -Competitive (mean=3.58) (SD=0.983) -Computer skills (mean=3.98) (SD=0.909) -Problem solving skills (mean=3.90) (SD=0.758) -Critical thinking skills (mean=3.77) (SD=0.803) -Ability to manage my time effectively (mean=3.27) (SD=1.057) -Interpersonal skills

		(mean=3.60) (SD=1.041) -Interpersonal skills (mean=3.92) (SD=0.717)	(mean=3.66) (SD=1.146) -Interpersonal skills (mean=3.84) (SD=0.916) <u>COMPIXX:</u> -Academic ability (mean=3.20) (SD=0.447) -Competitive (mean=3.0) (SD=1.0) -Computer skills (mean=3.60) (SD=1.517) -Problem solving skills (mean=3.80) (SD=0.837) -Programming ability (mean=3.40) (SD=0.894) -Critical thinking skills (mean=4.0) (SD=0.707) -Ability to manage my time effectively	(mean=3.25) (SD=0.957) -Interpersonal skills (mean=3.25) (SD=1.708)	(mean=3.44) (SD=1.050) -Interpersonal skills (mean=3.84) (SD=0.908)	(mean=3.75) (SD=0.910) Programming ability
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			(mean=2.20) (SD=1.304) -Interpersonal skills (mean=3.40) (SD=1.140)			
I feel well prepared to undertake this unit.	<ul style="list-style-type: none"> <li>• Not at all</li> <li>• Very little</li> <li>• Fairly well</li> <li>• Quite well</li> <li>• Very well</li> <li>• Unsure</li> </ul>	-Fairly well, 8, 32% -Quite well, 12, 48% -Very well, 4, 16% -Unsure, 1, 4%	<u>ISYS1XX:</u> -Very little, 4, 10.5% -Fairly well, 12, 31.6% -Quite well, 16, 42.1% -Very well, 6, 15.8% <u>COMPIXX:</u> -Very little, 2, 40% -Fairly well, 1, 20% -Quite well, 2, 40%	<u>Doing 1 unit:</u> -Very little, 2, 50% -Fairly well, 1, 25% -Quite well, 1, 25%	-Not at all, 6, 0.6% -Very little, 70, 7% -Fairly well, 312, 31% -Quite well, 431, 42.8% -Very well, 171, 17% -Unsure, 16, 1.6%	-Not at all, 6, 1.0% -Very little, 34, 5.7% -Fairly well, 142, 23.9% -Quite well, 266, 44.7% -Very well, 140, 23.5% -Unsure, 7, 1.2%
I have programming experience/understanding of the IS discipline/content outside this unit.	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul> If YES, please provide further information	Yes, 7, 28% No, 18, 72%	<u>ISYS1XX:</u> Yes, 8, 21.1% No, 30, 78.9% <u>COMPIXX:</u> Yes, 3, 60% No, 2, 40%	<u>Doing 1 unit:</u> Yes, 0 No, 4, 100%	Yes, 162, 16.1% No, 842, 83.9%	Not asked in this case study

I am taking this unit because:	(Mark all that applies) <ul style="list-style-type: none"> <li>Degree requirement</li> <li>Want to learn about computing</li> <li>Planet Unit</li> <li>PACE Unit</li> <li>Other</li> </ul>	-Degree requirement, 12, 48% -Want to learn about computing, 13, 52% -Planet Unit, 2, 8% -Other, 3, 12%	<u>ISYS1XX:</u> -Degree requirement, 35, 92.1% -Want to learn more about IS, 15, 39.5% <u>COMPIXX:</u> -Degree requirement, 3, 60% -Want to learn more about computing, 4, 80%	<u>Doing 1 unit:</u> -Degree requirement, 3, 75% -Want to learn about the subject, 2, 50% -Planet Unit, 1, 25%	-Degree requirement, 761, 75.9% -Want to learn about content, 444, 44.3% -Planet Unit, 142, 14.2% -PACE Unit, 4, 0.4% -Other, 35, 3.5%	Not asked in this case study
How would you rate your motivation in this unit? -I am motivated to do my required work in this unit -I feel confident that I will do well in this unit -I have to work too hard to succeed in this unit -To accomplish my goals, it is	Not true (1) Slightly true (2) Moderately true (3) Mostly true (4) Very true (5)	-I am motivated to do my required work in this unit (mean=3.8) (SD=0.781) -I feel confident that I will do well in this unit (mean=3.84) (SD=0.8) -I have to work too hard to succeed in this unit (mean=3.0) (SD=1.155)	<u>ISYS1XX:</u> -I am motivated to do my required work in this unit (mean=3.82) (SD=1.087) -I feel confident that I will do well in this unit (mean=3.37) (SD=0.998) -I have to work too hard to succeed in this unit (mean=3.39) (SD=1.242)	<u>Doing 1 unit:</u> -I am motivated to do my required work in this unit (mean=4.75) (SD=0.5) -I feel confident that I will do well in this unit (mean=3.25) (SD=0.957) -I have to work too hard to succeed in this unit (mean=2.5) (SD=1.915)	-I am motivated to do my required work in this unit (mean=3.94) (SD=0.969) -I feel confident that I will do well in this unit (mean=3.43) (SD=0.925) -I have to work too hard to succeed in this unit (mean=3.39) (SD=1.138)	-I am motivated to do my required work in this unit (mean=3.60) (SD=1.004) -I feel confident that I will do well in this unit (mean=3.48) (SD=0.970) -I have to work too hard to succeed in this unit

important that I do well in this unit -I persist even when an assessment task is challenging for me		-To accomplish my goals, it is important that I do well in this unit (mean=3.80) (SD=1.118) -I persist even when an assessment task is challenging for me (mean=3.76) (SD=0.926)	-To accomplish my goals, it is important that I do well in this unit (mean=4.11) (SD=0.863) -I persist even when an assessment task is challenging for me (mean=4.32) (SD=0.775) Missing=2 <u>COMPIXX:</u> -I am motivated to do my required work in this unit (mean=3.60) (SD=1.140) -I feel confident that I will do well in this unit (mean=2.60) (SD=0.894) -I have to work too hard to succeed in this unit (mean=3.0) (SD=1.871) -To accomplish my goals, it is	-To accomplish my goals, it is important that I do well in this unit (mean=3.5) (SD=1.732) -I persist even when an assessment task is challenging for me (mean=5.0) (SD=0)	-To accomplish my goals, it is important that I do well in this unit (mean=4.12) (SD=0.872) -I persist even when an assessment task is challenging for me (mean=4.13) (SD=0.844)	(mean=3.14) (SD=1.168) -To accomplish my goals, it is important that I do well in this unit (mean=3.82) (SD=1.046) -I persist even when an assessment task is challenging for me (mean=4.01) (SD=0.870)
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			important that I do well in this unit (mean=4.20) (SD=0.837) -I persist even when an assessment task is challenging for me (mean=3.80) (SD=0.837)			
Do you think there are factors that may affect your academic performance in this unit?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	Yes, 12, 48% No, 13, 52%	<u>ISYS1XX:</u> Yes, 19, 50% No, 19, 50% <u>COMP1XX:</u> Yes, 3, 60% No, 2, 40%	<u>Doing 1 unit:</u> Yes, 4, 100% No, 0	Yes, 441, 68.1% No, 207, 31.9%	Not asked in this case study
If YES, which of the following factors can affect your academic performance in this unit? (Asked in the Initial Survey)	(Mark all that applies) <ul style="list-style-type: none"> <li>• Family responsibility/commitments</li> <li>• Mental health</li> <li>• Emotional health (lack of motivation, fear of failure etc.)</li> <li>• Physical or health disability</li> <li>• Financial issues</li> <li>• Felt under-prepared for this unit</li> </ul>	-Family responsibility/commitments, 7, 53.8% -Emotional health, 5, 38.5% -Physical or health disability, 4, 30.8% -Financial issues, 5, 38.5% -Felt under-prepared for this unit, 1, 7.7%	<u>ISYS1XX:</u> -Family responsibility/commitments, 8, 40% -Emotional health, 9, 45% -Physical or health disability, 2, 10% -Financial issues, 4, 20% -Felt under-prepared for this unit, 5, 25%	<u>Doing 1 unit:</u> -Family responsibility, 1, 25% -Emotional health, 1, 25% -Physical or health disability, 1, 25% -Financial issues, 2, 50% -Paid work commitments, 2, 50% -Other, 1, 25%	-Family responsibility/commitments, 208, 45.1% -Emotional health, 263, 57% -Physical or health disability, 69, 15% -Financial issues, 78, 16.9% -Felt under-prepared for this unit, 133, 28.9%	Not asked in this case study

	<ul style="list-style-type: none"> <li>• Communication skills</li> <li>• Issue with the teaching staff</li> <li>• Lack of student academic support</li> <li>• Religious commitments/activities</li> <li>• Social coping skills/social life style</li> <li>• Problems with daily travel</li> <li>• Paid work commitments</li> <li>• Other</li> </ul>	<ul style="list-style-type: none"> <li>- Communication skills, 2, 15.4%</li> <li>-Lack of student academic support, 1, 7.7%</li> <li>-Social coping skills/social life style, 3, 23.1%</li> <li>-Problems with daily travel, 3, 23.1%</li> <li>-Paid work commitments, 4, 30.8%</li> </ul>	<ul style="list-style-type: none"> <li>-Communication skills, 2, 10%</li> <li>-Issue with the teaching staff, 4, 20%</li> <li>-Lack of student academic support, 3, 15%</li> <li>-Social coping skills, 2, 10%</li> <li>-Problems with daily travel, 3, 15%</li> <li>-Paid work commitments, 6, 30%</li> <li>-Other, 2, 10%</li> <li><u>COMPLXX:</u></li> <li>-Family responsibility/commitments, 3, 100%</li> <li>-Emotional health, 2, 66.7%</li> <li>-Physical or health disability, 1, 33.3%</li> <li>-Financial issues, 1, 33.3%</li> </ul>		<ul style="list-style-type: none"> <li>-Communication skills, 74, 16.1%</li> <li>-Issue with the teaching staff, 34, 7.4%</li> <li>-Lack of student academic support, 35, 7.6%</li> <li>-Religious commitments, 14, 3%</li> <li>-Social coping skills, 97, 21%</li> <li>-Problems with daily travel, 58, 12.6%</li> <li>-Paid work commitments, 171, 37.1%</li> <li>-Other, 43, 9.3%</li> </ul>	
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			-Felt under-prepared for this unit, 1, 33.3% -Problems with daily travel, 2, 66.7% -Paid work commitments, 3, 100%			
How would you rate your expectations of this unit? - Easy - Minimal course work - To be contacted regularly with academic support	Strongly disagree (1) Disagree (2) Neutral (3) Agree (4) Strongly agree (5)	-Easy (mean=3.8) (SD=1.304) -Minimal course work (mean=3.6) (SD=1.673) -To be contacted regularly with academic support (mean=3.2) (SD=1.095)	<u>ISYS1XX:</u> -Easy (mean=3.03) (SD=0.870) -Minimal course work (mean=2.94) (SD=0.919) -To be contacted regularly with academic support (mean=3.0) (SD=1.128) Missing=6 <u>COMPIXX:</u> -Easy (mean=2.0) (SD=0.707) -Minimal course work (mean=2.20) (SD=0.837)	<u>Doing 1 unit:</u> No valid cases	-Easy (mean=2.23) (SD=1.055) -Minimal course work (mean=2.28) (SD=0.908) -To be contacted regularly with academic support (mean=3.57) (SD=0.856)	Not asked in this case study

			-To be contacted regularly with academic support (mean=2.60) (SD=1.140)			
How would you rate your expectation(s) from the teaching staff in this unit? - Quality of teaching is high - Teaching staff are approachable - Teaching staff are usually available to discuss my work and give helpful feedback	Strongly disagree (1) Disagree (2) Neutral (3) Agree (4) Strongly agree (5)	-Quality of teaching is high (mean=4.12) (SD=0.726) -Teaching staff are approachable (mean=4.16) (SD=0.746) -Teaching staff are usually available to discuss my work and give helpful feedback (mean=4.08) (SD=0.812)	ISYS1XX: -Quality of teaching is high (mean=3.74) (SD=1.109) -Teaching staff are approachable (mean=3.82) (SD=1.086) -Teaching staff are usually available to discuss my work and give helpful feedback (mean=3.71) (SD=1.142) Missing=6 COMPIXX: -Quality of teaching is high (mean=4.40) (SD=0.548) -Teaching staff are approachable	<u>Doing 1 unit:</u> No valid cases	-Quality of teaching is high (mean=4.15) (SD=0.802) -Teaching staff are approachable (mean=4.11) (SD=0.855) -Teaching staff are usually available to discuss my work and give helpful feedback (mean=3.88) (SD=0.902)	Not asked in this case study

			(mean=4.0) (SD=0.707) -Teaching staff are usually available to discuss my work and give helpful feedback (mean=3.8) (SD=0.837)			
What led you to enrol at MQ?	(Mark all that applies) <ul style="list-style-type: none"> <li>• Close to home</li> <li>• Had the program I wanted to study</li> <li>• Affordable</li> <li>• Good reputation</li> <li>• Only university I got accepted</li> <li>• A family member attended or is attending</li> <li>• Other</li> </ul>	-Close to home, 10, 38.5% -Had the program I wanted to study, 13, 50% -Affordable, 1, 3.8% -Good reputation, 11, 42.3% -Only university I got accepted, 5, 19.2% -A family member attended or is attending, 1, 3.8% -Other, 2, 7.7%	<u>ISYS1XX:</u> -Close to home, 15, 45.5% -Had the program I wanted to study, 25, 75.8% -Affordable, 4, 12.1% -Good reputation, 21, 63.6% -Only university I got accepted, 7, 21.2% -A family member attended or is attending, 5, 15.2% -Other, 1, 3% <u>COMPIXX:</u> -Close to home, 2, 40%	-Close to home, 17, 24.6% -Had the program I wanted to study, 47, 68.1% -Affordable, 10, 14.5% -Good reputation, 33, 47.8% -Only university I got accepted, 17, 24.6% -A family member attended or is attending, 10, 14.5% -Other, 12, 17.4%	-Close to home, 358, 36.5% -Had the program I wanted to study, 775, 78.9% -Affordable, 77, 7.8% -Good reputation, 596, 60.7% -Only university I got accepted, 105, 10.7% -A family member attended or is attending, 132, 13.4% -Other, 86, 8.8%	Not asked in this case study

			-Had the program I wanted to study, 3, 60% -Good reputation, 3, 60% -Only university I got accepted, 1, 20%			
Are you aware of the available university support services?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul> If YES, please name at least three (3) support services	Yes, 11, 42.3% No, 15, 57.7%	<u>ISYS1XX:</u> Yes, 8, 24.2% No, 25, 75.8% <u>COMP1XX:</u> Yes, 0 No, 5, 100%	Yes, 13, 18.8% No, 56, 81.2%	Yes, 261, 26.6% No, 719, 73.4%	Not asked in this case study
Are you currently taking advantage of any university support services?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul> If YES, please provide further information.	Yes, 4, 15.4% No, 22, 84.6%	<u>ISYS1XX:</u> Yes, 4, 12.1% No, 29, 87.9% <u>COMP1XX:</u> Yes, 0 No, 5, 100%	Yes, 12, 17.6% No, 56, 82.4%	Yes, 110, 11.2% No, 873, 88.8%	Not asked in this case study
Would it be helpful to have access to a small document, such as a learning support guide (other than unit guide) that outlines the support services available, expectations of	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	Yes, 23, 88.5% No, 3, 11.5%	<u>ISYS1XX:</u> Yes, 29, 87.9% No, 4, 12.1% <u>COMP1XX:</u> Yes, 4, 80% No, 1, 20%	Yes, 56, 82.4% No, 12, 17.6%	Yes, 832, 84.8% No, 149, 15.2%	Not asked in this case study

students and processes at Macquarie University?						
In the future, would you like to be contacted if your performance in a unit is unsatisfactory?	<ul style="list-style-type: none"> <li>Yes</li> <li>No</li> </ul>	Yes, 16, 64% No, 9, 36%	<u>ISYS1XX:</u> Yes, 27, 79.4% No, 7, 20.6% <u>COMP1XX:</u> Yes, 3, 60% No, 2, 40%	Yes, 63, 90% No, 7, 10%	Yes, 890, 90.4% No, 95, 9.6%	Yes, 506, 79.4% No, 131, 20.6%
If YES, when would you like to be contacted?	(Mark all that applies) <ul style="list-style-type: none"> <li>As soon it occurs</li> <li>The first time it occurs</li> <li>Only after it happens more than once</li> <li>Following first assessment results</li> <li>Before Census date (Last date to withdraw from a unit without financial or academic penalty)</li> <li>Before exclusion date (Last date to withdraw from a unit without academic penalty, Financial penalty still applies)</li> <li>Other</li> </ul>	-As soon as it occurs, 16, 100% -The first time it occurs, 4, 25% -Only after it happens more than once, 2, 12.5% -Following first assessment results, 3, 18.8% -Before Census date, 3, 18.8% -Before exclusion date, 3, 18.8%	<u>ISYS1XX:</u> -As soon as it occurs, 21, 80.8% -The first time it occurs, 9, 34.6% -Only after it happens more than once, 1, 3.8% -Following first assessment results, 8, 30.8% -Before Census date, 8, 30.8% -Before exclusion date, 5, 19.2% <u>COMP1XX:</u> -As soon as it occurs, 3, 100% -The first time it occurs, 2, 66.7%	-As soon as it occurs, 50, 79.4% -The first time it occurs, 25, 39.7% -Only after it happens more than once, 9, 14.3% -Following first assessment results, 19, 30.2% -Before Census date, 26, 41.3% -Before exclusion date, 14, 22.2% -Other, 1, 1.6%	-As soon as it occurs, 671, 75.1% -The first time it occurs, 275, 30.8% -Only after it happens more than once, 176, 19.7% -Following first assessment results, 259, 29% -Before Census date, 193, 21.6% -Before exclusion date, 139, 15.5% -Other, 7, 0.8%	-As soon as it occurs, 326, 66.8% -The first time it occurs, 138, 28.3% -Only after it happens more than once, 119, 24.4% -Following first assessment results, 136, 27.9% -Before Census date, 230, 47.1% -Before exclusion date, 123, 25.2% -Other, 2, 0.4%

			-Following first assessment results, 2, 66.7% -Before Census date, 1, 33.3% -Before exclusion date, 1, 33.3%			
In the future, for what specific behaviours do you want to be contacted?	(Mark all that applies) <ul style="list-style-type: none"> <li>• Frequent absences</li> <li>• Lack of participation/effort</li> <li>• Low scores in assessments</li> <li>• Missing work</li> <li>• Not logged in to iLearn for more than a week</li> <li>• Discussion postings not read in iLearn</li> <li>• No participation in discussion forums in iLearn</li> <li>• Announcements in iLearn not read</li> <li>• Lecture content or lecture resources not viewed</li> <li>• In-class behavioural problems</li> </ul>	-Frequent absences, 5, 20% -Lack of participation, 4, 16% -Low scores in assessments, 16, 64% -Missing work, 11, 44% -Not logged in to iLearn for more than a week, 4, 16% -Not reading discussion posts, 2, 8% -No participation in discussion forums, 3, 12%	<u>ISYS1XX:</u> -Frequent absences, 10, 31.3% -Lack of participation, 9, 28.1% -Low scores in assessments, 25, 78.1% -Missing work, 17, 53.1% -Not logged in to iLearn for more than a week, 5, 15.6% -Not reading discussion posts, 2, 6.3% -No participation in discussion forums, 1, 3.1% -Announcements not read, 7, 21.9%	-Frequent absences, 25, 37.3% -Lack of participation, 35, 52.2% -Low scores in assessments, 60, 89.6% -Missing work, 45, 67.2% -Not logged in to iLearn for more than a week, 15, 22.4% -Not reading discussion posts, 2, 3.0% -No participation in discussion forums, 3, 4.5% -Announcements not read, 14, 20.9%	-Frequent absences, 259, 27% -Lack of participation, 414, 43.1% -Low scores in assessments, 814, 84.8% -Missing work, 540, 56.3% -Not logged in to iLearn for more than a week, 138, 14.4% -Not reading discussion posts, 85, 8.9% -No participation in discussion forums, 117, 12.2%	-Frequent absences, 187, 30.8% -Lack of participation/effort, 271, 44.6% -Low scores in assessments, 438, 72.2% -Missing work, 348, 57.3% -Not logged in to iLearn for more than a week, 77, 12.7% -Not reading discussion posts, 55, 9.1% -No participation in discussion forums, 49, 8.1%

	<ul style="list-style-type: none"> <li>• How I am doing compared to the rest of the class?</li> <li>• Plagiarism</li> <li>• None</li> <li>• Other</li> </ul>	<ul style="list-style-type: none"> <li>- Announcements not read, 5, 20%</li> <li>-Lecture content not viewed, 4, 16%</li> <li>-In-class behavioural problems, 4, 16%</li> <li>-None, 5, 20%</li> <li>-Other, 2, 8%</li> </ul>	<ul style="list-style-type: none"> <li>-Lecture content not viewed, 8, 25%</li> <li>-In-class behavioural problems, 5, 15.6%</li> <li>-None, 2, 6.3%</li> <li>Missing=8</li> <li><u>COMPLXX:</u></li> <li>-Frequent absences, 1, 25%</li> <li>-Lack of participation, 1, 25%</li> <li>-Low scores in assessments, 3, 75%</li> <li>-Missing work, 2, 50%</li> <li>-Announcements not read, 1, 25%</li> <li>-Lecture content not viewed, 2, 50%</li> <li>-In-class behavioural problems, 1, 25%</li> <li>-None, 1, 25%</li> </ul>	<ul style="list-style-type: none"> <li>-Lecture content not viewed, 18, 26.9%</li> <li>-In-class behavioural problems, 23, 34.3%</li> <li>-None, 1, 1.5%</li> </ul>	<ul style="list-style-type: none"> <li>-Announcements not read, 164, 17.1%</li> <li>-Lecture content not viewed, 192, 20%</li> <li>-In-class behavioural problems, 211, 22%</li> <li>-How I am doing compared to the rest of the class?, 626, 65.2%</li> <li>-None, 50, 5.2%</li> <li>-Other, 13, 1.4%</li> </ul>	<ul style="list-style-type: none"> <li>- Announcements not read, 127, 20.9%</li> <li>-Lecture content not viewed, 115, 18.9%</li> <li>-In-class behavioural problems, 130, 21.4%</li> <li>-How I am doing compared to the rest of the class?, 383, 63.1%</li> <li>-Plagiarism, 207, 34.1%</li> <li>-None, 34, 5.6%</li> <li>-Other, 4, 0.7%</li> </ul>
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In the future, how would you like to be advised about opportunities to seek assistance?	(Mark all that applies) Pilot/CS-1 (some)/CS-2 <ul style="list-style-type: none"> <li>Email</li> <li>Letter/post card</li> <li>Mobile phone</li> <li>Home telephone</li> <li>Face-to-face</li> <li>Other</li> </ul> CS-3/CS-4 <ul style="list-style-type: none"> <li>University Email</li> <li>Personal Email</li> <li>Face-to-face</li> <li>Letter/post card</li> <li>Mobile phone</li> <li>Home telephone</li> <li>SMS</li> <li>Social networks (i.e. Facebook, Twitter)</li> <li>Other</li> </ul>	-Email, 23, 95.8% -Letter/post card by post, 1, 4.2% -Mobile phone, 8, 33.3% -Home telephone, 3, 12.5% -Face-to-face, 8, 33.3%	<u>ISYS1XX:</u> -Email, 27, 87.1% -Face-to-face, 12, 38.7% -Other, 1, 3.2% <u>COMPIXX:</u> -Email, 3, 75% -Face-to-face, 2, 50%	-Email, 53, 81.5% -Letter/post card by post, 4, 6.2% -Mobile phone, 19, 29.2% -Home telephone, 1, 1.5% -Face-to-face, 25, 38.5% -Other, 2, 3.1%	-University Email, 853, 87.8% -Personal Email, 284, 29.2% -Letter/post card by post, 80, 8.2% -Mobile/Cell phone, 226, 23.3% -Home telephone, 19, 2% -Face-to-face, 314, 32.3% -Other, 53, 81.5% (0.7%)	-University Email, 549, 90.4% -Personal Email, 155, 25.5% -Letter/post card by post, 54, 8.9% -Mobile phone, 101, 16.6% -Home telephone, 2, 0.3% -Face-to-face, 180, 29.7% -SMS, 145, 23.9% -Social networks (i.e. Facebook, Twitter), 57, (9.4%) -Other, 5, (0.8%)
From the following strategies, which do you think would motivate you to seek help?	(Mark all that applies) <ul style="list-style-type: none"> <li>Talking with the teaching staff to work out a plan to improve my grade</li> <li>Receiving a specific written plan on how to improve my grade</li> </ul>	-Talking with the teaching staff to work out a plan to improve my grade, 14, 58.3%	This question was not asked in Case Study 1. The convenors for both units felt that asking students about these options would	-Talking with the teaching staff to work out a plan to improve my grade, 51, 76.1% -Receiving a specific written plan on how to	-Talking with the teaching staff to work out a plan to improve my grade, 641, 65.9% -Receiving a specific written plan on how to	-Talking with the teaching staff to work out a plan to improve my grade, 421, 69.4%

	<p>from the teaching staff</p> <ul style="list-style-type: none"> <li>• Meet with tutor(s)</li> <li>• Meeting with other students that are also having problems in this unit to form a study group</li> <li>• Talking with a student counsellor/support services about how to work through my problems</li> <li>• Attending a workshop/seminar with other students to go over improvement strategies</li> <li>• Getting an email/letter about how I am doing in a class is enough</li> <li>• Getting a phone call from the teaching staff to help me work through my options</li> <li>• Actively participating in</li> </ul>	<p>-Receiving a specific written plan on how to improve my grade from the teaching staff, 7, 29.2%</p> <p>-Meeting with tutor(s) , 16, 66.7%</p> <p>-Meeting with other students that are also having problems in the class to form a study group, 2, 8.3%</p> <p>-Talking with a counsellor/support services about how to work through my problems, 3, 12.5%</p> <p>-Attending a workshop/seminars with other students to go over improvement</p>	<p>mislead students to think they might receive help in any or all of these ways in the current offerings.</p>	<p>improve my grade from the teaching staff, 34, 50.7%</p> <p>-Meeting with tutor(s) , 36, 53.7%</p> <p>-Meeting with other students that are also having problems in the class to form a study group, 20, 29.9%</p> <p>-Talking with a counsellor/support services about how to work through my problems, 22, 32.8%</p> <p>-Attending a workshop/seminars with other students to go over improvement strategies, 20, 29.9%</p> <p>-Getting an email/letter about how I am doing in</p>	<p>improve my grade, 513, 52.8%</p> <p>-Meeting with a tutor(s) , 523, 53.8%</p> <p>-Meeting with other students that are also having problems in the class to form a study group, 335, 34.5%</p> <p>-Talking with a counsellor/support services about how to work through my problems, 251, 25.8%</p> <p>-Attending a workshop/seminars with other students to go over improvement strategies, 327, 33.6%</p> <p>-Getting an email/letter about how I am doing in a class is enough, 278, 28.6%</p>	<p>-Receiving a specific written plan on how to improve my grade from the teaching staff, 338, 55.7%</p> <p>-Meeting with other students that are also having problems in the class to form a study group, 198, 32.6%</p> <p>-Talking with a counsellor/support services about how to work through my problems, 203, 33.4%</p> <p>-Attending a workshop/seminars with other students to go over improvement strategies, 214, 35.3%</p>
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	<p>discussion forums to get information from the teaching staff and other students on how to improve</p> <ul style="list-style-type: none"> <li>• Manage myself</li> <li>• Other</li> </ul>	<p>strategies, 5, 20.8%</p> <p>-Getting an email/letter about how I am doing in a class is enough, 6, 25%</p> <p>-Getting a phone call from the teaching staff to help me work through my options, 2, 8.3%</p> <p>-Actively participating in discussion forums to get information from the teaching staff and other students on how to improve, 4, 16.7%</p> <p>-Manage myself, 7, 29.2%</p>		<p>a class is enough, 24, 35.8%</p> <p>-Getting a phone call from the teaching staff to help me work through my options, 13, 19.4%</p> <p>-Actively participating in discussion forums to get information from the teaching staff and other students on how to improve, 12, 17.9%</p> <p>-Manage myself, 27, 40.3%</p>	<p>-Getting a phone call from the teaching staff to help me work through my options, 116, 11.9%</p> <p>-Actively participating in discussion forums to get information from the teaching staff and other students on how to improve, 130, 13.4%</p> <p>-Manage myself, 318, 32.7%</p> <p>-Other, 5, 0.5%</p>	<p>-Getting an email/letter about how I am doing in a class is enough, 202, 33.3%</p> <p>-Getting a phone call from the teaching staff to help me work through my options, 69, 11.4%</p> <p>-Actively participating in discussion forums to get information from the teaching staff and other students on how to improve, 81, 13.3%</p> <p>-Manage myself, 202, 33.3%</p> <p>-Other, 4, 0.7%</p>
If you were asked for permission for your data in	<ul style="list-style-type: none"> <li>• Agree</li> <li>• Disagree</li> <li>• Not sure</li> </ul>	Not asked in this case study	Not asked in this case study	Not asked in this case study	Agree, 674, 68.4%	Disagree, 49, 5%

iLearn, or other academic data held by university, to be used to identify and send early alerts about your performance, would you:					Not sure, 262, 26.6%	Disagree, 40, 6.6% Not sure, 163, 26.9%
If you were asked for permission to access your demographic and academic background to support your learning, would you:	<ul style="list-style-type: none"> <li>• Agree</li> <li>• Disagree</li> <li>• Not sure</li> </ul>	Not asked in this case study	Not asked in this case study	Not asked in this case study	Agree, 655, 66.5% Disagree, 94, 9.5% Not sure, 236, 24%	Agree, 400, 65.9% Disagree, 70, 11.5% Not sure, 137, 22.6%
What was your attitude towards being contacted? -I was glad to speak to my teaching staff about my situation -I appreciated that there was someone watching out for me	Strongly disagree (1) Disagree (2) Neutral (3) Agree (4) Strongly agree (5)	-I was glad to speak to my teaching staff about my situation (mean=3.20) (SD=1.095) -I appreciated that there was someone watching out for me (mean=4.0) (SD=1.225)	<u>ISYS1XX:</u> -I was glad to speak to my teaching staff about my situation (mean=5) -I appreciated that there was someone watching out for me (mean=4.0)	Not asked in this case study. No interventions were done.	-I was glad to speak to my teaching staff about my situation (mean=0.33) (SD=1.104) -I appreciated that there was someone watching out for me (mean=3.98) (SD=0.969)	-I was glad to speak to my teaching staff about my situation (mean=3.80) (SD=1.094) -I appreciated that there was someone watching out for me (mean=4.14) (SD=1.008)

-I was grateful that somebody contacted me about my academic standing in this unit		-I was grateful that somebody contacted me about my academic standing in this unit (mean=4.0) (SD=1.225)	-I was grateful that somebody contacted me about my academic standing in this unit (mean=4.0) Missing=3 N=1 so SD is not calculated		-I was grateful that somebody contacted me about my academic standing in this unit (mean=3.94) (SD=0.988)	-I was grateful that somebody contacted me about my academic standing in this unit (mean=4.14) (SD=1.019)
Please specify, if there are OTHER attitude(s) towards being contacted?	Text Box	Not asked in pilot	Not asked in this case study	Not asked in this case study. No interventions were done.	Not asked in this case study	Text response
What is your attitude toward interventions and academic standing in this unit? -I feel better prepared to deal with my academic situation -I feel more comfortable now to seek academic assistance during the semester	Strongly disagree (1) Disagree (2) Neutral (3) Agree (4) Strongly agree (5)	-I feel better prepared to deal with my academic situation (mean=2.80) (SD=1.789) -Now I know where to seek help for my academic studies (mean=3.20) (SD=1.304) -I believe that student support	<u>ISYS1XX:</u> -I feel better prepared to deal with my academic situation (mean=3.0) -Now I know where to seek help for my academic studies (mean=3.0) -I believe that student support services help (mean=4.0)	Not asked in this case study. No interventions were done.	-I feel better prepared to deal with my academic situation (mean=3.44) (SD=0.978) -Now I know where to seek help for my academic studies (mean=3.61) (SD=0.961) -I believe that student support services help	I feel better prepared to deal with my academic situation (mean=3.69) (SD=0.949) -Now I know where to seek help for my academic studies (mean=3.49) (SD=1.019) -I believe that student support

-Now I know where to seek help for my academic studies -I believe that student support services help		services help (mean=3.60) (SD=1.140) -I feel more comfortable now to seek academic assistance during the semester	-I feel more comfortable now to seek academic assistance during the semester Missing=3 N=1 so SD is not calculated		(mean=3.56) (SD=1.018) -I feel more comfortable now to seek academic assistance during the semester	services help (mean=3.49) (SD=0.994) -I feel more comfortable now to seek academic assistance during the semester (mean=3.51) (SD=0.968)
Please indicate how you felt about how you were doing in the unit after being contacted by email?	Text box	Not asked in pilot	Not asked in this case study	Not asked in this case study. No interventions were done.	Not asked in this case study	Text box
Which of the following factors, if any, impeded your academic performance in this unit? (Asked in the Follow-up Survey)	(Mark all that applies) <ul style="list-style-type: none"> <li>Family responsibility</li> <li>Mental health</li> <li>Emotional health (lack of motivation, fear of failure etc.)</li> <li>Physical or health disability</li> <li>Financial issues</li> <li>Felt under-prepared for this unit</li> </ul>	-Family responsibility/commitments, 3, 30% -Emotional health (lack of motivation, fear of failure etc.) , 4, 40% -Financial issues, 1, 10%	<u>ISYS1XX:</u> -Family responsibility, 7, 38.9% -Emotional health, 8, 44.4% -Physical health, 3, 16.7% -Financial issues, 3, 16.7% -Issue with the teaching staff, 4, 22.2%	This question was part of the Follow-up survey. Only the Initial survey was sent at the end of the semester. No interventions were done.	-Family responsibility/commitments, 225, 46.3% -Emotional health, 305, 62.8% -Physical health, 77, 15.8% -Financial issues, 79, 16.3% -Felt under-prepared for this unit, 158, 32.5%	-Family responsibility/commitments, 284, 47.7% -Mental health, 114, 19.2% -Emotional health, 293, 49.2% -Physical health, 42, 7.1%

	<ul style="list-style-type: none"> <li>• Communication skills</li> <li>• Issue with the teaching staff</li> <li>• Lack of student academic support</li> <li>• Religious commitments/activities</li> <li>• Social coping skills/social life style</li> <li>• Problems with daily travel</li> <li>• Paid work commitments</li> <li>• Other</li> </ul>	<ul style="list-style-type: none"> <li>-Issue with the teaching staff, 1, 10%</li> <li>-Felt under-prepared for this unit, 1, 10%</li> <li>-</li> <li>Communication skills, 2, 20%</li> <li>-Lack of student academic support, 2, 20%</li> <li>-Problems with daily travel, 3, 30%</li> <li>-Other, 1, 10%</li> </ul>	<ul style="list-style-type: none"> <li>-Felt under-prepared for this unit, 4, 22.2%</li> <li>-Communication skills, 4, 22.2%</li> <li>-Lack of student academic support, 1, 5.6%</li> <li>-Social coping skills, 1, 5.6%</li> <li>-Problems with daily travel, 3, 16.7%</li> <li>-Paid work commitments, 6, 33.3%</li> <li>-Other, 1, 5.6%</li> </ul>		<ul style="list-style-type: none"> <li>-Communication skills, 67, 13.8%</li> <li>-Issue with the teaching staff, 27, 5.6%</li> <li>-Lack of student academic support, 43, 8.8%</li> <li>-Religious commitments/activities, 21, 4.3%</li> <li>-Social coping skills, 125, 25.7%</li> <li>-Problems with daily travel, 82, 16.9%</li> <li>-Paid work commitments, 149, 30.7%</li> <li>-Other, 31, 6.4%</li> </ul>	<ul style="list-style-type: none"> <li>-Financial issues, 103, 17.3%</li> <li>-Felt under-prepared for this unit, 155, 26.1%</li> <li>-Issue with the teaching staff, 60, 10.1%</li> <li>-Lack of student academic support, 68, 11.4%</li> <li>-Religious commitments/activities, 24, 4.0%</li> <li>-Social coping skills, 102, 17.1%</li> <li>-Problems with daily travel, 126, 21.2%</li> <li>-Paid work commitments, 194, 32.6%</li> <li>-Other, 70, 11.8%</li> </ul>
Were you contacted by a teaching or student support	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	<ul style="list-style-type: none"> <li>Yes, 6, 50%</li> <li>No, 6, 50%</li> </ul>	<ul style="list-style-type: none"> <li>ISYS1XX:</li> <li>Yes, 4, 19%</li> <li>No, 17, 81%</li> </ul>	Not asked in this case study. No interventions were done.	<ul style="list-style-type: none"> <li>Yes, 55, 10.5%</li> <li>No, 468, 89.5%</li> </ul>	<ul style="list-style-type: none"> <li>Yes, 88, 14.8%</li> <li>No, 507, 85.2%</li> </ul>

staff at any stage about your academic performance in this unit?						
Did you follow-up or take any action as a result of being contacted?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	Yes, 3, 60% No, 2, 40%	<u>ISYS1XX:</u> Yes, 1, 25% No, 3, 75%	Not asked in this case study. No interventions were done.	Yes, 39, 70.9% No, 16, 29.1%	Yes, 65, 73.9% No, 23, 26.1%
What specific action(s) did you take when you were first contacted?	(Mark all that applies) <ul style="list-style-type: none"> <li>• Set an appointment for in-person meeting with my teaching staff</li> <li>• Emailed teaching staff and asked for more information on what to do</li> <li>• Ignored the message</li> <li>• Telephoned unit convenor as a result of receiving notification</li> <li>• Got attentive and started to work seriously</li> <li>• Other</li> </ul>	-Emailed teaching staff and asked for more information on what to do, 1, 20% -Ignored the message, 1, 20% -Got attentive and started to work seriously, 2, 40% -Other, 1, 10%	<u>ISYS1XX:</u> -Emailed teaching staff and asked for more information on what to do, 1, 100%	Not asked in this case study. No interventions were done.	-Set an appointment for in-person meeting with my teaching staff, 11, 29.7% -Emailed teaching staff and asked for more information on what to do, 22, 59.5% -Ignored the message, 2, 5.4% -Got attentive and started to work seriously, 7, 18.9% -Other, 6, 16.2%	-Set an appointment for in-person meeting with my teaching staff, 13, 20.3% -Emailed teaching staff and asked for more information on what to do, 31, 48.4% -Ignored the message, 1, 1.6% -Got attentive and started to work seriously, 32, 50% -Other, 6, 9.4%

Which actions(s) were you advised to take?	(Mark all that applies) <ul style="list-style-type: none"> <li>• Speak with the teaching staff</li> <li>• Attend lecture(s)</li> <li>• Attend tutorial, mixed class, workshop or practical</li> <li>• Listen to online lectures</li> <li>• Complete missing/late work (assignments, diagnostic quiz, mid-semester exam, weekly submissions)</li> <li>• Get external coaching</li> <li>• Withdraw from the unit</li> <li>• Apply for special consideration/disruption of studies</li> <li>• Other</li> </ul>	-Speak with the teaching staff, 2, 66.7% -Attend lecture(s) and mixed class, 1, 33.3% -Listen to online lectures, 1, 33.3%	<u>ISYS1XX:</u> -Attend lecture(s) and mixed class, 2, 50% -Listen to online lectures, 1, 25% -Speak with the teaching staff, 1, 25%	Not asked in this case study. No interventions were done.	-Speak with the teaching staff, 28, 56% -Attend lecture(s), 9, 18% -Attend tutorial, mixed class, workshop or practical, 14, 28% -Listen to online lectures, 4, 8% -Complete missing/late work, 17, 34% -I did not take any action, 9, 18% -Other, 3, 6%	-Speak with the teaching staff, 37, 46.3% -Attend lecture(s), 23, 28.7% -Attend tutorial, mixed class, workshop or practical, 36, 45% -Listen to online lectures, 19, 23.8% -Complete missing/late work, 29, 36.3% -Get external coaching, 3, 3.8% -Withdraw from the unit, 14, 17.5% -Apply for special consideration, 8, 10% -Other, 8, 10%
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Which actions(s) did you take?	(Mark all that applies) <ul style="list-style-type: none"> <li>• Speak with the teaching staff</li> <li>• Attend lecture(s)</li> <li>• Attend tutorial, mixed class, workshop or practical</li> <li>• Listen to online lectures</li> <li>• Complete missing/late work (assignments, diagnostic quiz, mid-semester exam, weekly submissions)</li> <li>• Get external coaching</li> <li>• Withdraw from the unit</li> <li>• Apply for special consideration/disruption of studies</li> <li>• I did not take any action</li> <li>• Other</li> </ul>	Did you turn in missing/late work? Yes, 2, 40% No, 3, 60% Did you apply for Special Consideration for any assessments? Yes, 0 No, 5, 100% Did you make up/redo any weekly submissions? Yes, 0 No, 5, 100% Did you get tutoring help outside the university? Yes, 1, 20% No, 4, 80% Did you visit a coaching centre outside the university? Yes, 0 No, 5, 100%	<u>ISYS1XX:</u> Did you turn in missing/late work? Yes, 0 No, 1, 100% Did you apply for Special Consideration for any assessments? Yes, 0 No, 1, 100% Did you make up/redo any weekly submissions? Yes, 0 No, 1, 100% Did you get tutoring help outside the university? Yes, 0 No, 1, 100% Did you visit a coaching centre outside the university? Yes, 0 No, 1, 100%	Not asked in this case study. No interventions were done.	Did you turn in missing/late work? Yes, 23, 43.4% No, 30, 56.6% Did you apply for Special Consideration for any assessments? Yes, 17, 32.7% No, 35, 67.3% Did you make up/redo any weekly submissions? Yes, 17, 32.1% No, 36, 67.9% Did you get tutoring help outside the university? Yes, 3, 5.7% No, 50, 94.3% Did you visit a coaching centre outside the university? Yes, 3, 5.8% No, 49, 94.2%	-Speak with the teaching staff, 23, 28.7% -Attend lecture(s) , 25, 31.3% -Attend tutorial, mixed class, workshop or practical, 40, 50% -Listen to online lectures, 26, 32.5% -Complete missing/late work, 25, 31.3% -Get external coaching, 4, 5.0% -Withdraw from the unit, 4, 5.0% -Apply for special consideration, 9, 11.3% -I did not take any action, 9, 11.3% -Other, 3, 3.8%
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Did receiving an email from your unit convenor change how you studied for this unit? If so please provide details. What did you change or do differently?	(Mark all that applies) <ul style="list-style-type: none"> <li>• It made me start to engage more with the readings and/or forums</li> <li>• It made me complete missing assignments and/or quizzes</li> <li>• It made me realise that I needed to get help in the unit</li> <li>• It made me want to give up</li> <li>• Other</li> </ul>	Not asked in pilot	Not asked in this case study	Not asked in this case study. No interventions were done.	Not asked in this case study	-It made me start to engage more with the readings and/or forums, 53, 61.6% -It made me complete missing assignments and/or quizzes, 35, 40.7% -It made me realise that I needed to get help in the unit, 6, 7% -It made me want to give up, 21, 24.4% -Other, 13, 15.1%
Do you think that receiving emails like this helped you to learn and do better in your unit?	(Mark all that applies) <ul style="list-style-type: none"> <li>• The email did help me to improve my study habits</li> <li>• The email did help me to realise I was falling behind</li> <li>• The email did help me by suggesting</li> </ul>	Not asked in pilot	Not asked in this case study	Not asked in this case study. No interventions were done.	Not asked in this case study	-The email did help me to improve my study habits, 51, 60.7% -The email did help me to realise I was

	<ul style="list-style-type: none"> <li>resources or help that I was not aware of</li> <li>The email did help me by telling me what I could do to improve my results in the unit</li> <li>Other</li> </ul>					<p>falling behind, 42, 50%</p> <p>-The email did help me by suggesting resources or help that I was not aware of, 18, 21.4%</p> <p>-The email did help me by telling me what I could do to improve my results in the unit, 29, 34.5%</p> <p>-Other, 7, 8.3%</p>
Now that you have received email(s) from your unit convenor, what would be the impact on you if you no longer received emails in other units?	<ul style="list-style-type: none"> <li>It would impact on me because I feel that I would not do as well in future if I did not receive emails such as I received</li> <li>I think there would be no impact on how well I do</li> <li>Other</li> </ul>	Not asked in pilot	Not asked in this case study	Not asked in this case study. No interventions were done.	Not asked in this case study	<p>-It would impact because I feel that I would not do as well in future if no such emails received, 43, 51.2%</p> <p>-I think there would be no impact on how well I do, 32, 38.1%</p> <p>-Other, 9, 10.7%</p>

Did the Early Alert improve your attendance in this unit?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Unsure</li> </ul>	Yes, 1, 20% No, 1, 20% Unsure, 3, 60%	<u>ISYS1XX:</u> Unsure, 1, 100%	Not asked in this case study. No interventions were done.	Yes, 18, 34% No, 18, 34% Unsure, 17, 32.1%	Not asked in this case study
Did the Early Alert improve your learning in this unit?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Unsure</li> </ul>	Yes, 0 No, 1, 20% Unsure, 4, 80%	<u>ISYS1XX:</u> Unsure, 1, 100%	Not asked in this case study. No interventions were done.	Yes, 22, 41.5% No, 11, 20.8% Unsure, 20, 37.7%	Not asked in this case study
Please indicate how you feel about your current academic standing after you were being contacted by an early alert notification?	<ul style="list-style-type: none"> <li>• Much better</li> <li>• Somewhat better</li> <li>• About the same</li> <li>• Somewhat worse</li> <li>• Much worse</li> </ul>	-About the same, 2, 40% -Somewhat worse, 1, 20% -Much worse, 2, 40%	<u>ISYS1XX:</u> -Somewhat worse, 1, 100%	Not asked in this case study. No interventions were done.	-Much better, 12, 22.6% -Somewhat better, 27, 50.9% -About the same, 12, 22.6% -Somewhat worse, 2, 3.8%	Not asked in this case study
What impact did receiving an email from your unit convenor have on your motivation to continue in the unit?	(Mark all that applies) <ul style="list-style-type: none"> <li>• It made me feel better</li> <li>• It made me feel worse</li> <li>• It made me feel like I could improve</li> <li>• Other</li> </ul>	Not asked in pilot	Not asked in this case study	Not asked in this case study. No interventions were done.	Not asked in this case study	-It made me feel better, 46, 54.8% -It made me feel worse, 10, 11.9% -It made me feel like I could improve, 45, 53.6% -Other, 8, 9.5%

Please explain why you felt this way.	Text box	Not asked in pilot	Not asked in this case study	Not asked in this case study. No interventions were done.	Not asked in this case study	Text box
<p>What impact did receiving an email have on how you viewed your unit convenor?</p> <p>-It made me feel like the unit convenor was supporting me to do well</p> <p>-It made me feel like the unit convenor was concerned about me</p> <p>-It made me feel like the unit convenor was interested in what I did in the unit</p> <p>-It made the unit feel more personal</p>	<p>Strongly disagree (1)</p> <p>Disagree (2)</p> <p>Neutral (3)</p> <p>Agree (4)</p> <p>Strongly agree (5)</p>	Not asked in pilot	Not asked in this case study	Not asked in this case study. No interventions were done.	Not asked in this case study	<p>-It made me feel like the unit convenor was supporting me to do well (mean=4.23) (SD=0.734)</p> <p>-It made me feel like the unit convenor was concerned about me (mean=4.11) (SD=0.745)</p> <p>-It made me feel like the unit convenor was interested in what I did in the unit (mean=4.13) (SD=0.757)</p> <p>-It made the unit feel more personal (mean=3.98) (SD=0.806)</p>

What OTHER impact, receiving an email had on how you viewed your unit convenor?	Text box	Not asked in pilot	Not asked in this case study	Not asked in this case study. No interventions were done.	Not asked in this case study	Text box
Were you advised to seek help from any teaching or student support services?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	Yes, 2, 40% No, 3, 60%	<u>ISYS1XX:</u> Yes, 0 No, 1, 100%	Not asked in this case study. No interventions were done.	Yes, 25, 47.2% No, 28, 52.8%	Yes, 38, 45.2% No, 46, 54.8%
Which student support services from the campus wellbeing were you advised to visit?	(Mark all that applies) <ul style="list-style-type: none"> <li>• Financial aid services</li> <li>• Disability service (disability support unit)</li> <li>• Counselling service</li> <li>• Welfare service (financial aid services, academic progress issues)</li> <li>• Chaplaincy service</li> <li>• Numeracy centre</li> <li>• Health and wellbeing service</li> <li>• Learning skills program</li> <li>• Career &amp; Employment service</li> </ul>	-Counselling service, 2, 66.7% -Career & Employment service, 1, 33.3% -Academic Advice, 1, 33.3% -Ask.edu.au, 1, 33.3% -Other, 1, 33.3%	<u>ISYS1XX:</u> -Ask.edu.au, 1, 100%	Not asked in this case study. No interventions were done.	-Financial aid services, 1, 2.6% -DSU, 1, 2.6% -Counselling service, 9, 23.1% -Welfare service, 5, 12.8% -Chaplaincy service, 1, 2.6% -Numeracy centre, 3, 7.7% -Health and wellbeing service, 3, 7.7% -Learning skills program, 9, 23.1% -Career & Employment service, 1, 2.6% -ESOS, 2, 5.1%	-Financial aid services, 4, 4.8% -DSU, 3, 3.6% -Counselling service, 9, 10.7% -Welfare service, 6, 7.1% -Chaplaincy service, 2, 2.4% -Numeracy centre, 10, 11.9% -Health and wellbeing service, 7, 8.3% -Learning skills program, 13, 15.5%

	<ul style="list-style-type: none"> <li>• Education services for overseas students (ESOS)</li> <li>• Academic Advice</li> <li>• Tech Help</li> <li>• Ask.edu.au</li> <li>• Other</li> </ul>				-Academic Advice, 15, 38.5% -Tech Help, 2, 5.1% -Ask.edu.au, 9, 23.1% -Other, 2, 5.1%	-Career & Employment service, 7, 8.3% -ESOS, 2, 2.4% -Academic Advice, 23, 27.4% -Tech Help, 2, 2.4% -Ask.edu.au, 25, 29.8% -Other, 31, 36.9%
When you were contacted, were you provided with information about campus student support services that you did not previously know about?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	Yes, 2, 40% No, 3, 60%	<u>ISYS1XX:</u> Yes, 0 No, 1, 100%	Not asked in this case study. No interventions were done.	Yes, 21, 40.4% No, 31, 59.6%	Yes, 29, 34.5% No, 55, 65.5%
What is your attitude towards campus wellbeing services relevant to this unit?	(Mark all that applies) <ul style="list-style-type: none"> <li>• The hours of operation for the student support services were convenient</li> <li>• Student support services were available to help me</li> </ul>	-The hours of operation for the student support services were convenient, 1, 25% -Student support services were	<u>ISYS1XX:</u> -The hours of operation for the student support services were convenient, 1, 50% -Student support services were	Not asked in this case study. No interventions were done.	-The hours of operation for the student support services were convenient, 16, 41% -Student support services were	-The hours of operation for the student support services were convenient, 27, 32.1% -Student support services were

	<ul style="list-style-type: none"> <li>• Student support services provided me with the accurate information</li> <li>• Student support services were able to help resolve my issue(s)</li> <li>• Other</li> </ul>	available to help me, 4, 100% -Student support services were able to help resolve my issue(s) , 1, 25%	available to help me, 1, 50%		available to help me, 23, 59% -Student support services provided me with the accurate information, 11, 28.2% -Student support services were able to help resolve my issue(s) , 14, 35.9% -Other, 3, 7.7%	available to help me, 33, 39.3% -Student support services provided me with the accurate information, 10, 11.9% -Student support services were able to help resolve my issue(s) , 11, 13.1% -Other, 24, 28.6%
In future, would you want to receive similar emails in all the units that you were enrolled in?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Not sure</li> </ul>	Not asked in pilot	Not asked in this case study	Not asked in this case study. No interventions were done.	Not asked in this case study	-Yes, 65, 77.4% -No, 4, 4.8% -Not sure, 15, 17.9%
Please tell us the reason why made the selection you did.	Text box	Not asked in pilot	Not asked in this case study	Not asked in this case study. No interventions were done.	Not asked in this case study	Text box
Overall, how satisfied are you with the contact you received from the teaching or	<ul style="list-style-type: none"> <li>• Completely dissatisfied</li> <li>• Dissatisfied</li> <li>• Neutral</li> </ul>	-Neutral, 1, 20% -Satisfied, 3, 60% -Completely satisfied, 1, 20%	<u>ISYS1XX</u> : -Satisfied, 1, 100%	Not asked in this case study. No interventions were done.	-Dissatisfied, 2, 3.8% -Neutral, 22, 41.5%	-Completely dissatisfied, 2, 2.5% -Dissatisfied, 1, 1.3%

student support staff about your progress?	<ul style="list-style-type: none"> <li>• Satisfied</li> <li>• Completely satisfied</li> </ul>				-Satisfied, 21, 39.6% -Completely satisfied, 8, 15.1%	-Neutral, 21, 26.3% -Satisfied, 39, 48.8% -Completely satisfied, 17, 21.3%
Is there anything else you would like us to know?	<ul style="list-style-type: none"> <li>• Yes (Text box)</li> <li>• No</li> </ul>	<u>Initial:</u> Yes, 0 No, 11, 100%	<u>ISYS1XX:</u> <u>Initial:</u> Yes, 2, 9.5% No, 19, 90.5%	Yes, 16, 28.6% No, 40, 71.4%	Yes, 45, 8.8% No, 465, 91.2%	Yes, 62, 10.6% No, 525, 89.4%

*Note:* Totals for particular questions do not add up to the total responses as of missing values

## APPENDIX G

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### HOW TO INTERPRET MEAP

#### Introduction to the Engagement Block

The Engagement block is located on the unit page in the right-hand column.

The Block calculates an engagement score based on three different variables: Assessment, Login and Forum activity.

The convenor chooses the values for each of the variables.

The higher the engagement score the higher the level of disengagement (as measured by the block).

- A red symbol indicates that the score is greater than 80%.
- An orange symbol indicates a score of between 79-60%.
- A green symbol indicates a score below 59%.

A: If you want to view a particular student click on their name. You will see a Detailed student report.

B: For an alternative view you can select **View unit report**



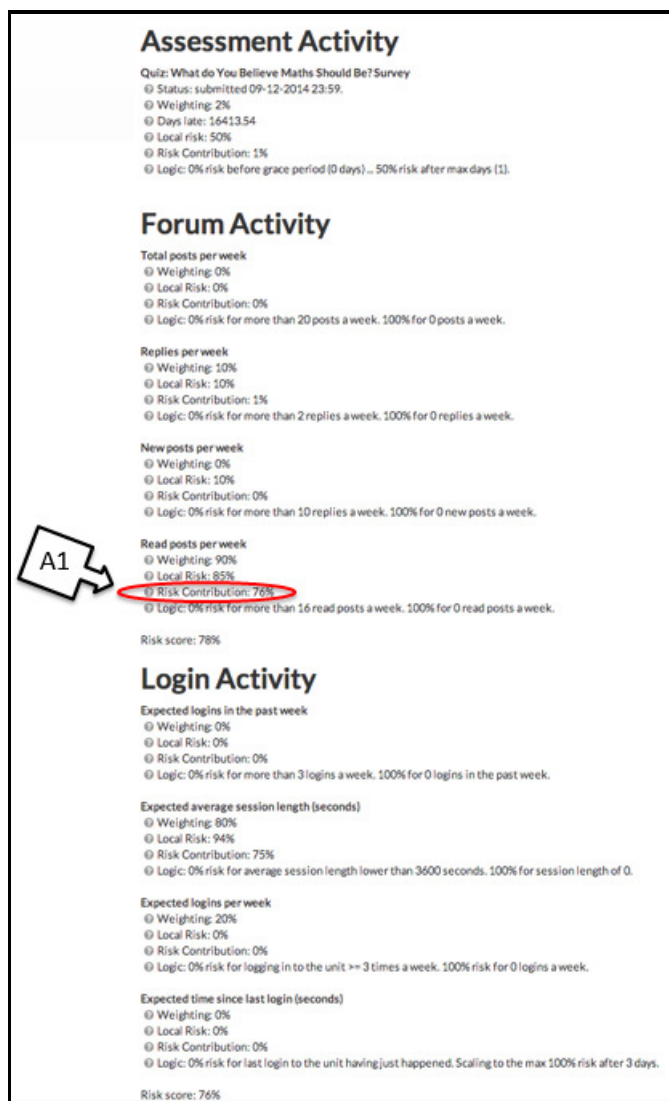
#### Detailed student report-Part 1

Once you have selected a student from the MEB that you want to examine, you will come to a screen like this.

The way to make use of this report is as Follows:

Step 1 (A1). Identify the areas that MEB has identified as contributing to the risk score.

You are looking for high values to Risk contribution (labelled A1 76%)



## Detailed student report-Part 2

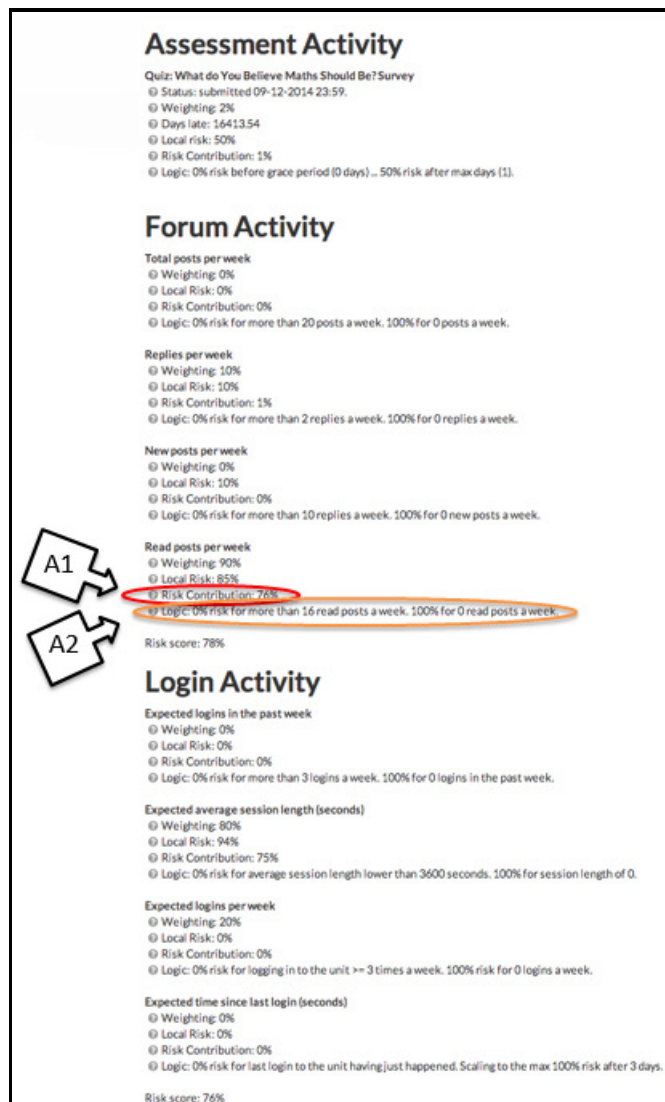
Once you have selected a student from the MEB that you want to examine, you will come to a screen like this. The way to make use of this report is as follows:

Step 1 (A1). Identify the areas that MEB has identified as contributing to the risk score.

You are looking for high values to **Risk contribution** (labeled A1 76%)

Step 2 (A2). Next below the Risk contribution you will see the condition that has triggered this alert.

For example, at A2 you will see that the MEB has determined that this student is at risk because they did not meet the condition (in this example read more than 16 posts in a week).



### Detailed student report-Part 3

Once you have selected a student from the MEB that you want to examine, you will come to a screen like this.

The way to make use of this report is as follows:

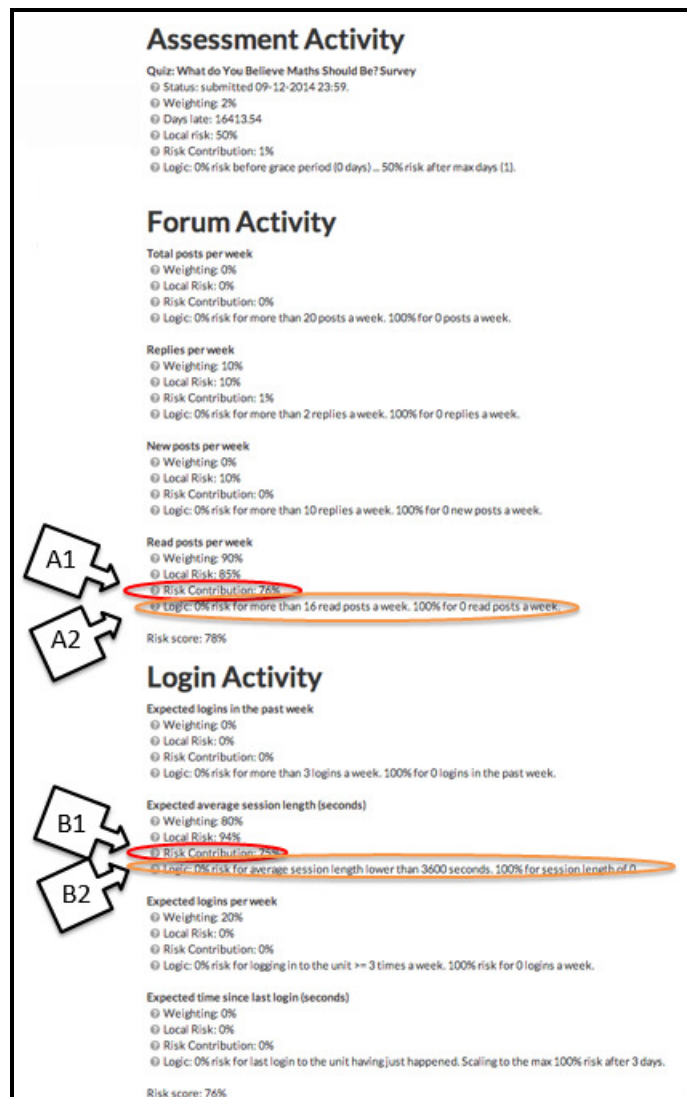
Step 1 (A1). Identify the areas that MEB has identified as contributing to the risk score.

You are looking for high values to **Risk contribution** (labeled A1 76%)

Step 2 (A2). Next below the Risk logging contribution you will see the condition that has triggered this alert.

For example, at A2 you will see that the MEB has determined that this student is at risk because they did not meet the condition (in this example read more than 16 posts in a week).

In this example there is also a risk contribution under Login activity, here labeled B1 and B2.



## Unit report

A: First make sure that you sort from the highest to the lowest Total score by selecting the arrow. **Remember the 'higher' the score the greater the level of disengagement.**

B: The Total score is calculated by adding the weighted scores for Assessment, Forum and Login together. In this example the first student has a total disengagement score of 78%, made up of Forum 40% and Login 37%. The raw score (score in brackets) is before the weighting has been applied. When setting up you indicate that percentage contribution of each activity: Assessment, Forum and Login to the total.

So for the student that scored 78% you would need to look at the forum activity and login activity for this student if you wanted more detail as to why they received a high disengagement score.

Scores are shown as "weighted score (raw score)"

	Assessment Activity	Forum Activity	Login Activity	Total
U	0% (2%)	40% (100%)	37% (93%)	78%
Li	0% (2%)	36% (91%)	32% (81%)	69%
C	0% (2%)	36% (91%)	32% (79%)	69%
EI	0% (1%)	36% (91%)	30% (76%)	67%
Je	0% (1%)	36% (91%)	30% (76%)	67%
K	0% (1%)	36% (91%)	30% (76%)	67%
Li	0% (1%)	36% (91%)	30% (76%)	67%

Diagram labels: A points to the 'Total' column header. B points to the 'Assessment Activity' column header.

Detailed look at what the student has done (or not) in the course:

If you want to look into why your student has received a high 'disengagement' score you will need to look at some of the reports in iLearn.

Go to the Tools Reports

For example, if we found a student was disengaged because they did not participate in forums for this week we could:

1. Select the Unit participation report
2. Select the forum (**lecture 1 ...**) in the Activity module
3. Select from Look back the time period say **2 weeks**
4. Select Show Only **Student**
5. Select Show actions **View**
6. Select **Go**
7. This shows you how many views of the forum each student has done in that time period.
8. Select **Show all** at bottom of page.
9. This will provide you with the option to **Select all 'No'**
10. You can then select the students that haven't engaged and send them a message in iLearn.

Note: you can look at all other activities in your Unit from this interface too.

The screenshot displays the Moodle 'Tools' menu on the left, with 'Unit participation' highlighted. The main content area shows the 'Unit participation' report for 'Lecture 1 - The Nature of Mathematics'. The report includes a search bar, a 'Show only' dropdown set to 'Student', and a 'View' button. Below this, a table lists 46 students with their participation status. The table has two columns: 'First name / Surname' and 'Status'. The status column contains 'Yes' or 'No' followed by a count in parentheses. For example, 'Yes (12)' or 'No (1)'. The table is paginated, showing 'Page 1' of 3. At the bottom, there are links for 'Show all 46', 'Show only 46', and 'With selected users...'. Numbered arrows 1-10 point to the following elements:

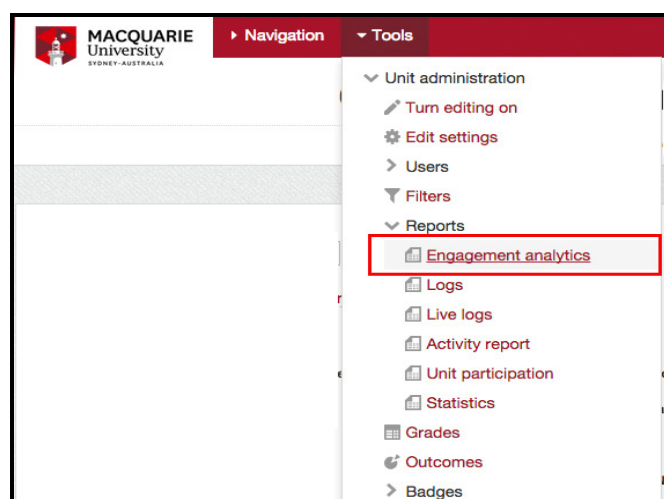
- 1: 'Unit participation' in the Tools menu.
- 2: 'Activity module' in the breadcrumb trail.
- 3: 'Lecture 1 - The Nature of Mathematics' in the breadcrumb trail.
- 4: 'Show only' dropdown menu.
- 5: 'View' button.
- 6: 'Go' button.
- 7: 'Status' column header in the student list table.
- 8: 'Show all 46' link.
- 9: 'Show only 46' link.
- 10: 'With selected users...' link.

# MEAP+ USER GUIDE

## What is MEAP+?

MEAP+ is an enhanced version of the Moodle Engagement Analytics Plugin. It allows you to use iLearn to identify how engaged your students are in your unit. You can then view information about these students and contact them via email from within iLearn to provide further support or encouragement.

Access the plugin from: Tools/Reports/Engagement analytics



## How does MEAP+ show me which students are disengaged?

In the engagement report you can see the contribution that each indicator has made to the total “at risk” percentage for each student.

Engagement engagement for unit:					
Scores are shown as 'weighted score (raw score)'					
Username	Assessment Activity	Forum Activity	Gradebook	Login Activity	Total
	25% (100%)	25% (100%)	25% (100%)	21% (83%)	96%
	25% (100%)	25% (100%)	25% (100%)	20% (81%)	95%
	25% (100%)	25% (100%)	25% (100%)	19% (76%)	94%
	25% (100%)	25% (100%)	25% (100%)	18% (71%)	93%
	25% (100%)	25% (100%)	25% (100%)	17% (66%)	92%
	25% (100%)	25% (100%)	25% (100%)	16% (62%)	91%
	25% (100%)	25% (100%)	25% (100%)	14% (56%)	89%

## How to set parameters?

To set the parameters, once you are in the engagement report in the top right Select > Update settings.

My home / AHIS140\_SHFYR\_2015\_ALL\_U / Reports / Engagement analytics Update settings

Engagement for course:

Download table data as

Numbers in parentheses are raw risk ratings for each indicator. Numbers outside parentheses are weighted risk ratings for each indicator - these are summed to give the total risk rating.

Username	Assessment Activity	Forum Activity	Gradebook	Login Activity	Total
	0% (0%)	15% (100%)	15% (100%)	70% (100%)	100%
	0% (0%)	15% (100%)	15% (100%)	70% (100%)	100%
	0% (0%)	9% (59%)	15% (100%)	70% (100%)	94%
	0% (0%)	9% (57%)	15% (100%)	70% (100%)	94%
	0% (0%)	15% (100%)	15% (100%)	48% (69%)	78%
	0% (0%)	15% (100%)	15% (100%)	44% (63%)	74%
	0% (0%)	15% (100%)	15% (100%)	44% (63%)	74%

## How does MEAP+ identify students?

MEAP+ calculates an “at risk” percentage for all your students in your unit. This percentage is based on indicators that you select for your unit.

In **Update settings** there are four indicators that you can use. You can use all or any combination of them depending on what you believe is relevant to identify students that are disengaged. You can also weight these indicators allowing you to determine the relative importance of them.

The indicators include whether students are:

1. Late in submitting assessments or quizzes (Assessment Activity indicator),
2. Infrequently login onto iLearn (Login Activity indicator),
3. Not obtaining sufficient marks in their tasks (Gradebook indicator),
4. Not participating in forums (Forum Activity indicator).

Within these indicators you can set the thresholds (or benchmarks) at which MEAP+ will flag when a student is disengaged. These scores are added together to give you a total risk percentage for each student.

Weighting

Indicator	
Assessment Activity	<input type="text" value="25"/> %
Forum Activity	<input type="text" value="25"/> %
Gradebook	<input type="text" value="25"/> %
Login Activity	<input type="text" value="25"/> %

Assessment Activity

Overdue Grace Days	<input type="text" value="0"/>
Overdue Maximum Days	<input type="text" value="14"/>
Overdue Submitted Weighting	<input type="text" value="50"/> %
Overdue Not Submitted Weighting	<input type="text" value="100"/> %

▼ Login Activity

Expected logins in the past week	2	Weighting	20	%
Expected logins per week	2	Weighting	30	%
Expected average session length (seconds)	600	Weighting	10	%
Expected time since last login (seconds)	604800	Weighting	40	%
Session Length (seconds)	3600			

▼ Gradebook

At risk if the following condition(s) are met:

[Category] quizzes (0.0-30.0)	less than		out of 30.0   Weighting		%
[Category] Essay - Academic Resources (0.0-30.0)	less than		out of 30.0   Weighting		%
[Category] Individual Research Project (0.0-30.0)	less than		out of 30.0   Weighting		%
[Category] Participation (0.0-10.0)	less than	5	out of 10.0   Weighting	100	%

▼ Forum Activity

New posts per week	No Risk	0.5	Max Risk	0	Weighting	12	%
Read posts per week	No Risk	1	Max Risk	0	Weighting	12	%
Replies per week	No Risk	1	Max Risk	0	Weighting	20	%
Total posts per week	No Risk	1	Max Risk	0	Weighting	56	%

Do not forget at the bottom of the page where you set the parameters to select > Save changes.

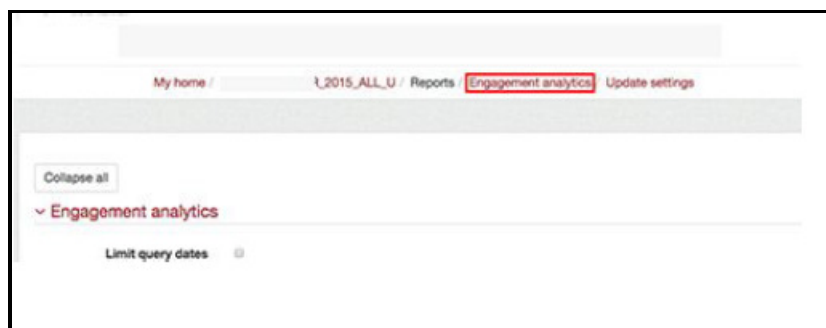
Expand all

- > Engagement analytics
- > Weighting
- > Assessment Activity
- > Forum Activity
- > Gradebook
- > Login Activity

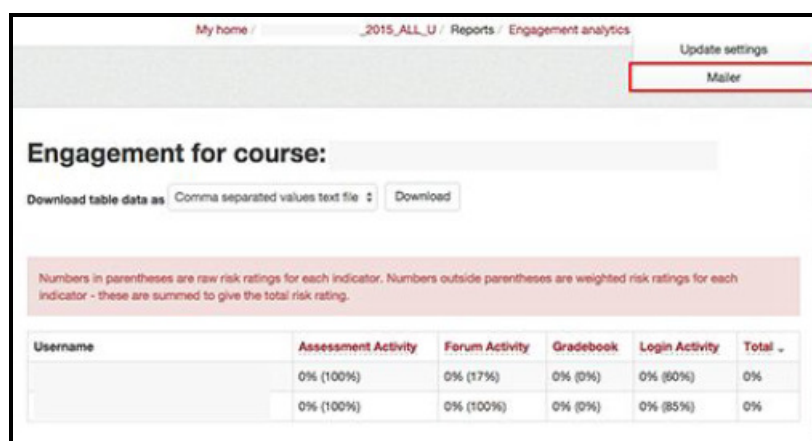
Save changes Cancel

## How can I send and compose messages to students?

To go to the Mailer after you have set the parameters use the breadcrumbs to go back to the Engagement analytics report



To access the Mailer in the top right **Select > Mailer**



## How can I choose which students to send messages to in MEAP+?

From the **Mailer** you receive an overview of how the indicators have been triggered by the students and what the “at risk” percentage is for each student.

You can identify which students you may wish to send a message to, and what the topic of the message should relate to: Late submission of assessments (Assess.), Forum participation (Forum), Performance in assignments (Grade.) and login to iLearn (Login).

You can write emails with multiple topics. The system groups those students that are to receive the same messages.

Finally, you can see how many messages a student has already been sent.

Select message type(s)				Data										
Asses.	Forum	Grade.	Login	Username	Assessment Activity	Forum Activity	Gradebook	Login Activity	Total risk	Mgs sent				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		14 overdue 0 submitted	0 read posts 0 posted	100% risk 1 triggered 0 not triggered	78 days since last login 1.0 logins per week	95%	0				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		14 overdue 0 submitted	0 read posts 0 posted	100% risk 1 triggered 0 not triggered	121 days since last login 1.0 logins per week	95%	1 0 days ago				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		14 overdue 0 submitted	0 read posts 0 posted	100% risk 1 triggered 0 not triggered	63 days since last login 1.2 logins per week	94%	1 0 days ago				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		14 overdue 0 submitted	0 read posts 0 posted	100% risk 1 triggered 0 not triggered	55 days since last login 1.5 logins per week	92%	1 0 days ago				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		14 overdue 0 submitted	0 read posts 0 posted	100% risk 1 triggered 0 not triggered	103 days since last login 2.0 logins per week	91%	1 0 days ago				
Showing 1 to 5 of 531 entries														
						Previous	1	2	3	4	5	...	107	Next

## How can I compose my message in MEAP+?

Once you have selected the students the message composition page (**Compose messages**) will allow you to quickly select from a bank of messages (**Message snippets**). These messages are categorised around late assessments, forum participation, performance in assignments, logins to iLearn and also encouragement.

The table at the top provides you with information to help you compose a relevant and targeted email.

In **Message body** you can add personal information so that each student receives a personalised addressed email. You can also add your own customised message for each group of student and **Save to my message Bank**.

Group with: Forum Activity

Show 5 entries

Search:

Select message type(s)

Data

Asses.	Forum	Grade.	Login	Username	Assessment Activity	Forum Activity	Gradebook	Login Activity	Total risk	Msgs sent
	<input checked="" type="checkbox"/>				14 overdue 0 submitted	0 read posts 0 posted	100% risk 1 triggered 0 not triggered	78 days since last login 1.0 logins per week	95%	0
	<input checked="" type="checkbox"/>				14 overdue 0 submitted	0 read posts 0 posted	100% risk 1 triggered 0 not triggered	121 days since last login 1.0 logins per week	95%	1 0 days ago

Showing 1 to 2 of 2 entries

Previous 1 Next

Show/hide ☐ Extra details in table

The following message will be sent to: 2 students as listed above

Sender  Chris Froissard <jean-christophe.froissard@mq.edu.au>

Reply to  Chris Froissard <jean-christophe.froissard@mq.edu.au>

Message subject

Message body

Dear {FIRSTNAME#},

Kind regards,  
[Your name here]  
[Building] [Room]  
[Other contact details]

Message snippets  Choose...

Save message ☐ Save to my message bank

Short description:

## NOTES ON WRITING AN EMAIL IN MEAP+

### Subject heading in emails

Unit convenors should include the unit code in the subject heading of their emails. Remember that students may not know which unit the message is referring to, so it's a good idea to include the unit code in the subject heading.

Also some convenors are using humour in their subject heading to get the attention of students; for example “ACCG2XX If you snooze you lose!”. As unit convenors, you would know what would get the attention of your students. If appropriate, consider using a humorous or a short, catchy subject heading.

### Signatures in emails

Ensure that all emails from convenors include the name and/or position at the end of the email. Remember it's a good idea to include a contact and position description at the end of your emails. We suggest that you start by copying and pasting your email signature from Gmail in message composition in Mailer, edit it and click 'Save to my message bank'. You could then add this signature to all your emails by selecting it from **My saved messages** in **Message snippets**.

The screenshot displays the MEAP+ message composition interface. It features a 'Message body' section with a signature for Chris Froissard, Educational Designer, Educational Design & Development Group, Learning & Teaching Centre, Level 4, Room 416, C3B Building | Macquarie University NSW 2109 Australia. Below this is a 'Message snippets' section with a dropdown menu set to 'My saved messages'. A snippet titled 'No discussion participation' is visible, containing a greeting 'Dear {#FIRSTNAME#},', a reminder to post in the online discussion board, and a 'Kind regards' sign-off. At the bottom, there is a 'Save message' section with a checkbox for 'Save to my message bank' and a 'Short description' field containing the text 'my signature'.

### A note about message composition

To help ensure that we compose the most effective messages, we asked a student support staff member from the Business faculty, to write about composing student emails. Here is what she wrote:

“Most MEAP+ messages are currently being written in response to an omission on behalf of the student. Generally, the intention of a message is to affect some change in behaviour. In order to be effective, the message needs to be clear and the tone needs to be supportive.”

We encourage you to use the message snippets and to adapt them to meet your needs when required. The message snippets have been composed with the aim of communicating expectations in a calm and encouraging manner. The tone and grammar of the snippets have been reviewed by multiple users.

Generally, an effective way to approach a request for a change in behaviour is to:

- a) State the problem
- b) Remind the student of the importance of an aspect of the unit, or of a certain behaviour
- c) Provide a solution, or a clear message of expected behaviour
- d) Offer support or words of encouragement.

For example:

I have noticed that you did not complete the first quiz.

Keeping up with the regular quizzes not only contributes to your final grade, but is a way to test yourself and get feedback on some of the fundamental aspects of the unit.

Remember that you can check on the due dates of all assessments in the unit guide, available at [Link provided here]. It would be a good idea to write these dates in your calendar with reminders.

If you are finding this unit difficult, please don't hesitate to come and see me during my consultation hours to ask for additional help.

Kind regards...

It may be tempting, but it is best to try to avoid communicating the threat of impending doom. Aim to state what you want to say without emotion. This will make your message more effective. The student will be more likely to follow your advice or come to see you for assistance.

## APPENDIX H

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### TEACHER PERSPECTIVE STUDY INITIAL AND FOLLOW-UP INTERVIEW QUESTIONS

#### Comments

Convenors to attend an orientation/training session on how MEAP works.

#### Post orientation session:

- Looking at your course what variables would you set for the parameters in MEAP?
- What do you think are the most effective variables to measure student performance in your unit?

#### Pre MEB implementation:

#### Background

- How would you rate your level of proficiency in the use of iLearn for teaching?
  - Novice
  - Intermediate
  - Advanced
  - Expert
- On average during a course how many students would you contact that are falling behind?
  - <1%
  - 2-5%
  - 6-10%
  - >10%
- How much experience do you have in convening this particular course (semesters) and courses in iLearn in general (years)?
- How similar is this current unit to previous ones? For example, are there more or different online activities? Are the assessments different?
- Before this project had you ever heard or been interested in learning analytics?

#### Planned use of MEAP

- How useful do you think the Moodle engagement block will be to your role as an online convenor?
- How do you think you might use the MEAP?
- Do you think using the MEAP will add to your workload?
- What do you think will be your biggest challenge in using MEAP?
- When do you think MEAP will be of most use to you?

### Student Alerts

- If you had the capability would you like to send out alerts to students that were falling behind in the course?
- How do you think sending out student alerts would impact on your workload?
- What information would like to see to help you decide what to include in your alert?
- How would you like to send out student alerts? Email, through iLearn, telephone, other?

### Post MEAP implementation:

#### Actual use of MEAP

- When did you use MEAP?
- How did you use MEAP? Can you provide an example?
- Indicate to what extent you agree with the following statements:

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
I found the information obtained from the MEAP about individual students valuable					
The MEAP enables me to get an insight into how the student is doing in the course					
The MEAP provides relevant information regarding the student's interactions within iLearn					
I found the MEAP easy to setup					
I found the MEAP easy to use					

- How useful did you find the MEAP to your role as online convenor?
- Did using the MEAP add to your workload?
- What was your biggest challenge in using MEAP?
- When was MEAP of most use to you?
- How could the MEAP be improved?
- Would you like to continue to use the MEAP in future?
- Do you have any comments you would like to add about the MEAP?

### Student Alerts

- Did you send out any student alerts as a consequence of using the MEAP?
- What information did you send the student? How did you send it? (Perhaps keep a record of the information they send? For future purposes?)
- How did the student(s) react when they received an alert? Did it have the intended consequence or were there unintended consequences. Please describe in detail.
- Do you have any comments you would like to add about student alerts?

## TEACHER PERSPECTIVE STUDY STRUCTURED INTERVIEW QUESTIONS

### Demographics:

1. Name:
2. Gender:
3. Academic level:
4. iLearn Unit Code/s:

### Role and Experience:

5. Currently, which of the following best describes your primary work role?
  - ☐ Unit Convenor
  - ☐ Lecturer
  - ☐ Tutor
  - ☐ Student Support Staff
6. For how many years have you worked for Macquarie University and how much experience you have in your current role?

Please select one response per row.

	< 1 year	1-5 years	5-10 years	11-20 years	> 20 years
Working at MQ					
Experience in my current role					

7. How would you rate your level of proficiency in the use of iLearn for teaching?
  - ☐ Novice
  - ☐ Intermediate
  - ☐ Advanced
  - ☐ Expert
8. Before this project had you ever heard or been interested in learning analytics?
  - ☐ Yes
  - ☐ No

If YES, what type of analysis did you do? \_\_\_\_\_

9. For this project, how many unit/s are you managing this semester?

**Post MEAP+ Use:**

10. For the unit/s you are managing, in terms of identifying at-risk students which indicators did you consider? Please select all options that apply.

- ☐ Class attendance and participation (e.g. lectures, tutorials, workshops/practicals)
- ☐ iLearn access patterns (e.g. login frequency)
- ☐ Time spent in iLearn (duration)
- ☐ Discussion forums (e.g. posts read/generated)
- ☐ Announcements (read) in iLearn
- ☐ Use of dialogue tool
- ☐ Resources access patterns (e.g. opening readings, downloading, watching videos, duration)
- ☐ Assessment/assignment submissions (e.g. late, missing, incomplete, repeated attempts)
- ☐ Task completion (e.g. quiz, tutorial questions)
- ☐ Accessing lecture recordings
- ☐ Attainment of certain grades
- ☐ When a student approaches the academic staff (convenor, lecturer or tutor) concerned for their performance or ask for extensions
- ☐ In-class behavioural problems
- ☐ Student demographics (e.g. socio-economic status, ATARs, enrolment status etc.)
- ☐ Student social factors (hours of employment, family responsibilities, attitude towards learning, family and peer influence etc.)
- ☐ Not sure
- ☐ Other \_\_\_\_\_

11. When/how often did you use the MEAP+?

- ☐ 0
- ☐ 1
- ☐ 2-4
- ☐ >5

If not utilised, what is the reason? \_\_\_\_\_

12. For what built-in indicators did you use the MEAP+? Please select all options that apply.

- ☐ Login
- ☐ Forum
- ☐ Assessment
- ☐ Gradebook

What process did you go through to decide on the threshold values? Did you change the thresholds throughout the semester?

- ☐ Yes
- ☐ No

If YES, why? \_\_\_\_\_

13. How did you use the MEAP+? Can you provide an example? Please select all options that apply.

- ☐ Contacting students
- ☐ Analysing
- ☐ Viewing
- ☐ Other \_\_\_\_\_

Did you send out any student early alerts as a consequence of using the MEAP+?

- ☐ Yes
- ☐ No

If NO, what is the reason? \_\_\_\_\_

14. How useful did you find the MEAP+ to your current role in the identification of at-risk students?

15. Did using the MEAP+ add to your workload?

- ☐ Yes
- ☐ No
- ☐ Not sure

16. Briefly, what problem/difficulties/challenges you have encountered with use of the MEAP+? Please select all options that apply.

- ☐ Learning new interface
- ☐ Choosing benchmarks and weightings
- ☐ Interpretation of results
- ☐ Improving accuracy of results
- ☐ Reliability and validity of results
- ☐ Understanding how it works
- ☐ What to suggest further based on results
- ☐ False alerts
- ☐ How the algorithm works?
- ☐ Workload
- ☐ Composing an email
- ☐ Selecting snippet/s
- ☐ Students were bombarded with alert emails
- ☐ Students not reading alert/taking action
- ☐ Cannot differentiate between internal and external students
- ☐ Other \_\_\_\_\_

17. Have you experienced any difficulty while using the system?

- ☐ Yes
- ☐ No

If YES, how did you solve the problem?

18. Did you view the MEAP+ help resource?

- ☐ Yes
- ☐ No
- ☐ Not sure if there is any available

If YES, how did you find the help resource?

- ☐ Very helpful
- ☐ Somewhat helpful
- ☐ Helpful
- ☐ Not very helpful
- ☐ Not at all helpful

19. When was MEAP+ of most use to you? Please select all options that apply.

- ☐ Start of the semester, please say week \_\_\_\_
- ☐ Before HECS census date
- ☐ Before exclusion date
- ☐ Mid semester break
- ☐ When the assessment tasks are due
- ☐ After the semester
- ☐ Throughout the semester
- ☐ Other \_\_\_\_\_

20. What category best describe the nature of student early alerts sent by you?

- ☐ Academic
- ☐ Non-academic
- ☐ Combination of both
- ☐ Other \_\_\_\_\_

21. Which of the following actions (information) did you suggest the student as part of the early alert intervention? Please select all options that apply.

- ☐ Referrals to specific resources or services designed to assist at-risk students
- ☐ Offer of consultation for in-person with at-risk students
- ☐ Suggest consulting other teaching staff
- ☐ Attend lecture(s)
- ☐ Attend tutorial, mixed class, workshop or practical
- ☐ Listen to online lectures
- ☐ Complete missing/late work (assignments, diagnostic quiz, mid-semester exam, weekly submissions)
- ☐ Get external coaching
- ☐ Withdraw from the unit
- ☐ Acknowledgement of positive progress
- ☐ No suggestion
- ☐ Other \_\_\_\_\_

22. Do you inform your students by other means that an early alert for them has been submitted?

- ☐ Yes
- ☐ No

If YES, please describe the other means of communication. \_\_\_\_\_

23. Has an early alert from you prompted student action (such as student returning to class, contacting you or meeting with lecturer/tutor)?

- ☐ Yes
- ☐ No
- ☐ Not I am aware of/Not sure

If YES, please provide details \_\_\_\_\_

24. Overall, is MEAP+ been an effective intervention tool in changing/improving the success of alerted students in the unit/s you were involved for this project?

- ☐ Yes
- ☐ No
- ☐ Not sure

25. How could the MEAP+ be improved?

26. Would you like to continue to use the MEAP+ in future?

- ☐ Yes
- ☐ No
- ☐ Not sure

27. Do you have any comments you would like to add about student early alerts or the MEAP+?

28. Should the name student early alert be changed?

- ☐ Yes
- ☐ No

If YES, what is your suggestion? \_\_\_\_\_

### **Reporting:**

29. What reporting requirements do you follow in relation to identified students and contacted students?

30. Are you required to generate and send reports about these support activities?

31. Who do you send these reports to and how often?

32. Have you generated and used the mailer log (report)?

- ☐ Yes
- ☐ No

If YES, how you have used it? \_\_\_\_\_

**MEAP+ Evaluation:**

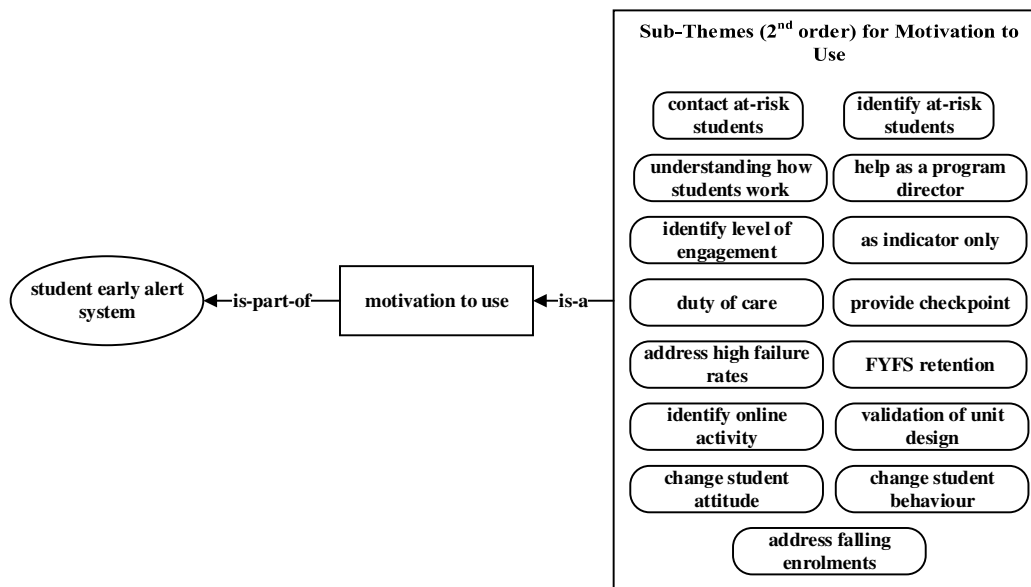
29. Indicate to what extent you agree with the following statements. Please select one response per row.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I found the MEAP+ easy to setup					
I found the MEAP+ easy to use					
The MEAP+ enables me to get an insight into how the student is doing in the unit/s					
I found the information obtained from the MEAP+ about individual students valuable					
The MEAP+ provides relevant information regarding the student's interactions within iLearn					
It was easy for me to use the MEAP+ to identify students that were at-risk					
It was easy for me to identify why students were at-risk					
The navigation through the MEAP+ was complicated					
Using the MEAP+ involves too much time doing mechanical operations (e.g. data input, time to compose and send an alert)					
I feel apprehensive about using the MEAP+ to identify and contact students at-risk					
I hesitate to use the MEAP+ for fear of making mistakes I cannot correct					
The project team members were available for assistance with MEAP+ difficulties					
I could complete more efficiently the same task that the MEAP+ allowed me to do on my own					
I intend to use MEAP+ for all students and not just at-risk students					
Using MEAP+ to enhance student academic success in a unit is a good idea					
I intend to use the MEAP+ next semester					
Our institution should use the MEAP+					

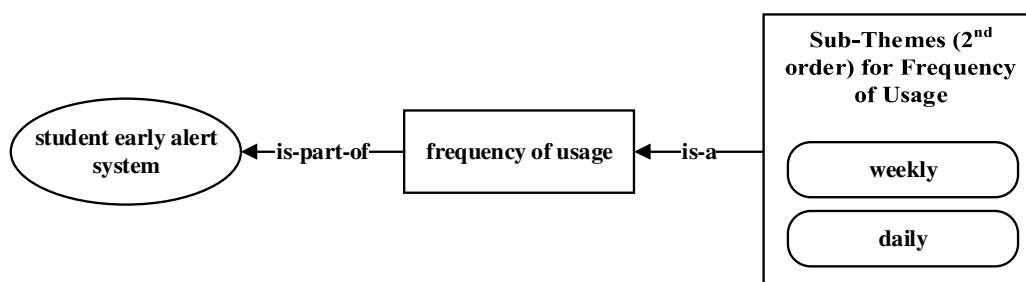
# APPENDIX I

## THEMATIC MAPS

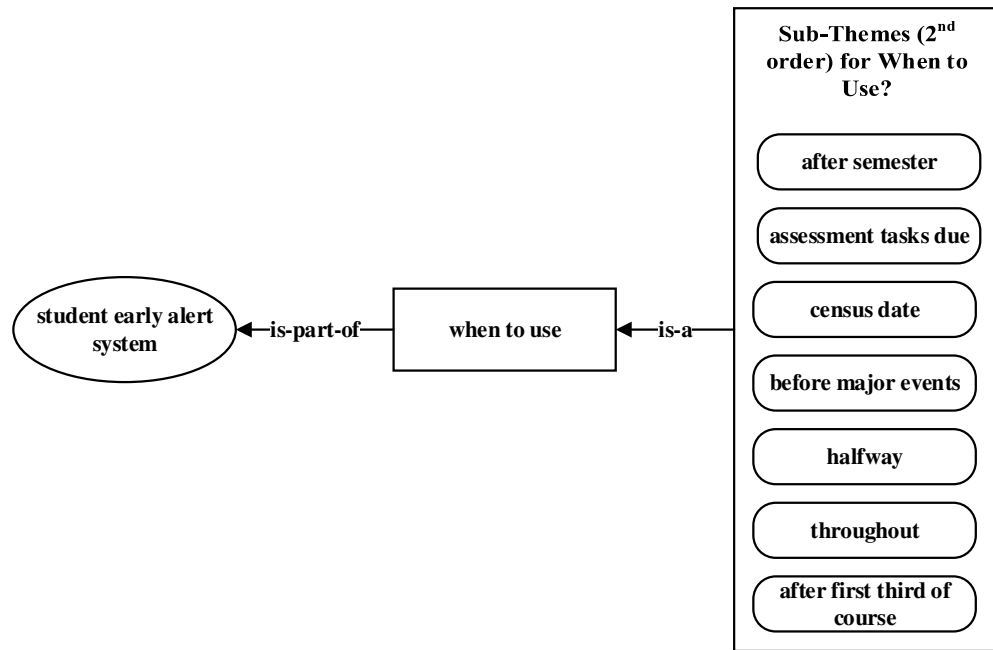
### Thematic Map for the Main Theme: Student Early Alert System



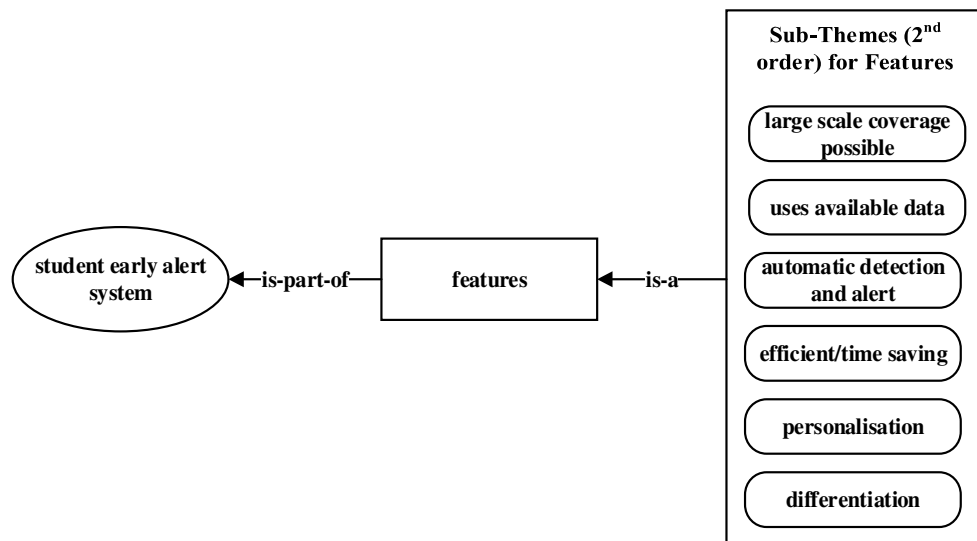
**Figure 1:** The thematic map. Ellipse show the main theme 'Student Early Alert System', rectangular box show the 1<sup>st</sup> order sub-theme 'Motivation to Use' and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes



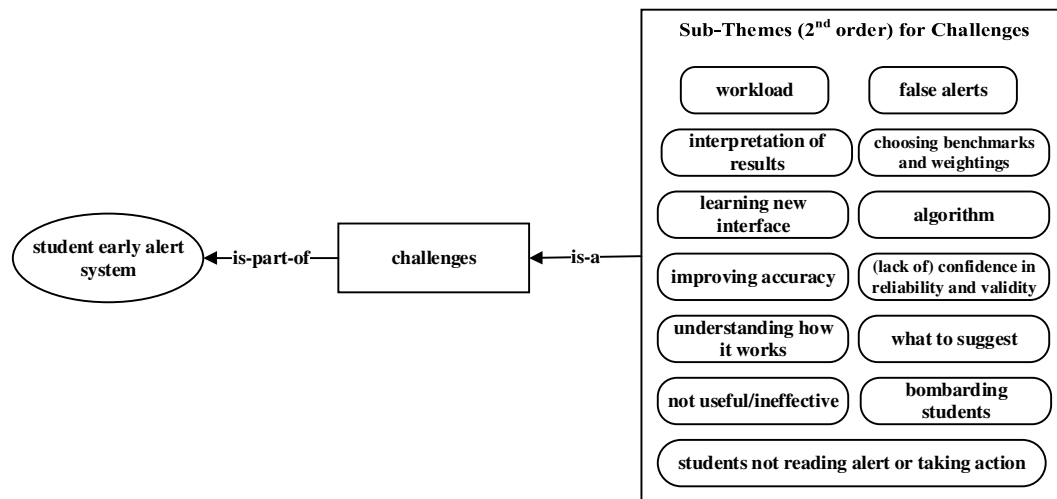
**Figure 2:** The thematic map. Ellipse show the main theme 'Student Early Alert System', rectangular box show the 1st order sub-theme 'Frequency of Usage' and rounded rectangular boxes show the 2nd order sub-themes



**Figure 3:** The thematic map. Ellipse show the main theme ‘Student Early Alert System’, rectangular box show the 1<sup>st</sup> order sub-theme ‘Motivation to Use’ and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes

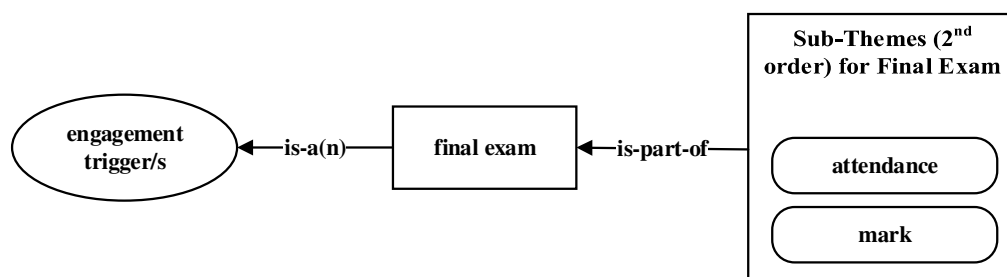


**Figure 4:** The thematic map. Ellipse show the main theme ‘Student Early Alert System’, rectangular box show the 1<sup>st</sup> order sub-theme ‘Features’ and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes

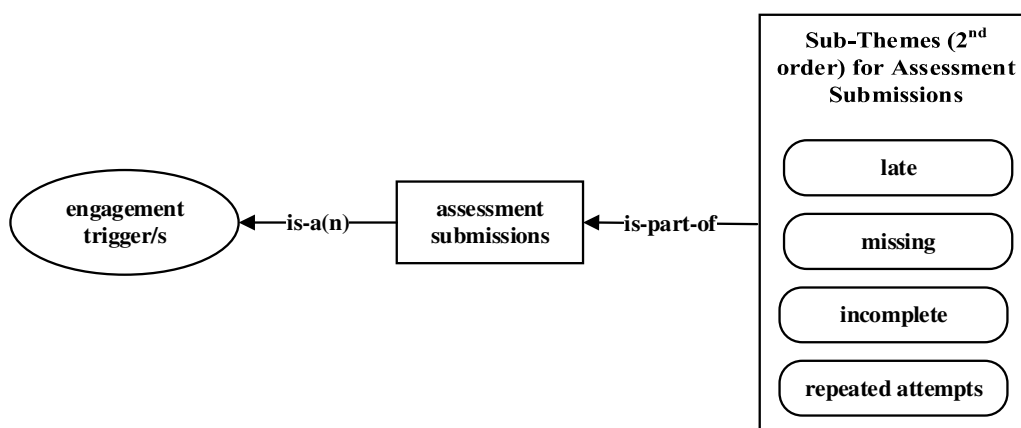


**Figure 5:** The thematic map. Ellipse show the main theme ‘Student Early Alert System’, rectangular box show the 1<sup>st</sup> order sub-theme ‘Challenges’ and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes

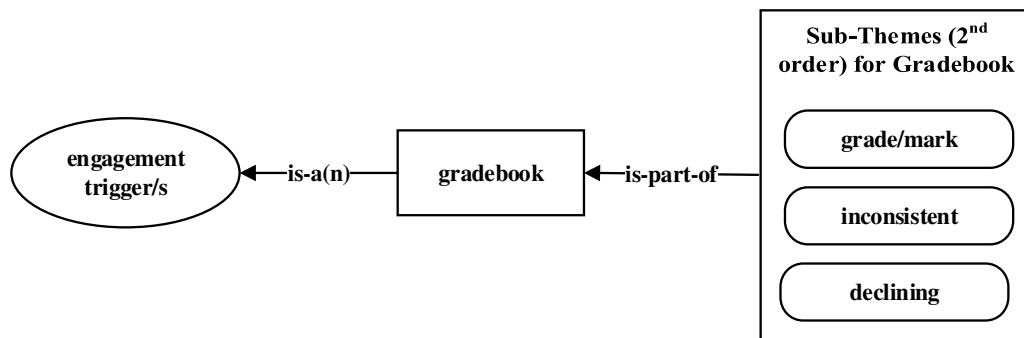
## Thematic Map for the Main Theme: Engagement Triggers/Identifiers



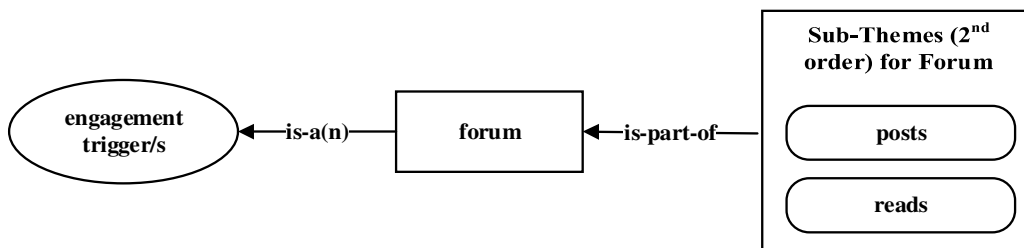
**Figure 6:** The thematic map. Ellipse show the main theme 'Engagement Triggers/Identifiers', rectangular box show the 1<sup>st</sup> order sub-theme 'Final Exam' and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes



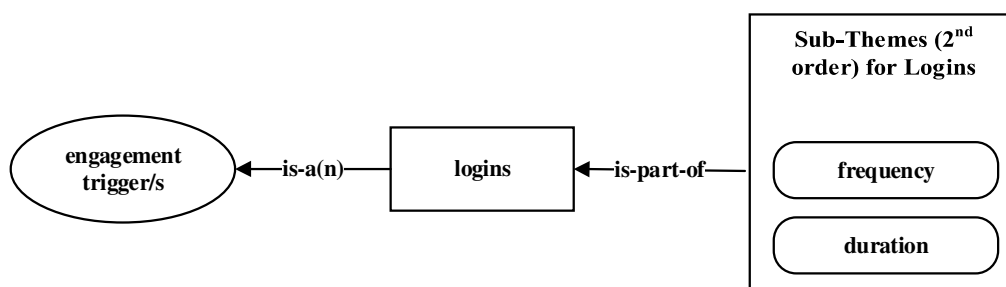
**Figure 7:** The thematic map. Ellipse show the main theme 'Engagement Triggers/Identifiers', rectangular box show the 1<sup>st</sup> order sub-theme 'Assessment Submissions' and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes



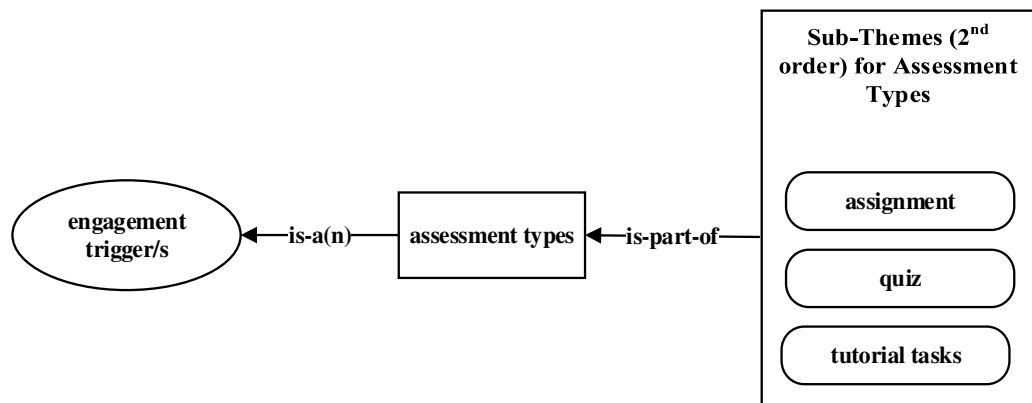
**Figure 8:** The thematic map. Ellipse show the main theme ‘Engagement Triggers/Identifiers’, rectangular box show the 1<sup>st</sup> order sub-theme ‘Gradebook’ and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes



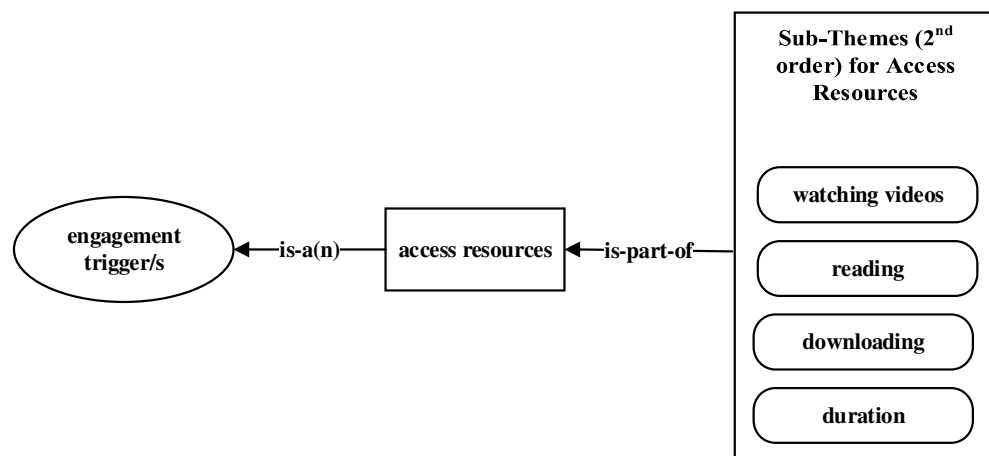
**Figure 9:** The thematic map. Ellipse show the main theme ‘Engagement Triggers/Identifiers’, rectangular box show the 1<sup>st</sup> order sub-theme ‘Forum’ and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes



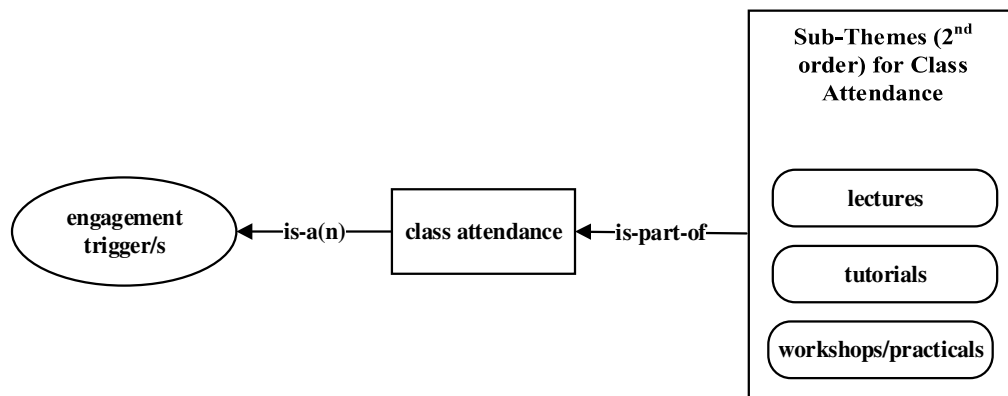
**Figure 10:** The thematic map. Ellipse show the main theme ‘Engagement Triggers/Identifiers’, rectangular box show the 1<sup>st</sup> order sub-theme ‘Logins’ and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes



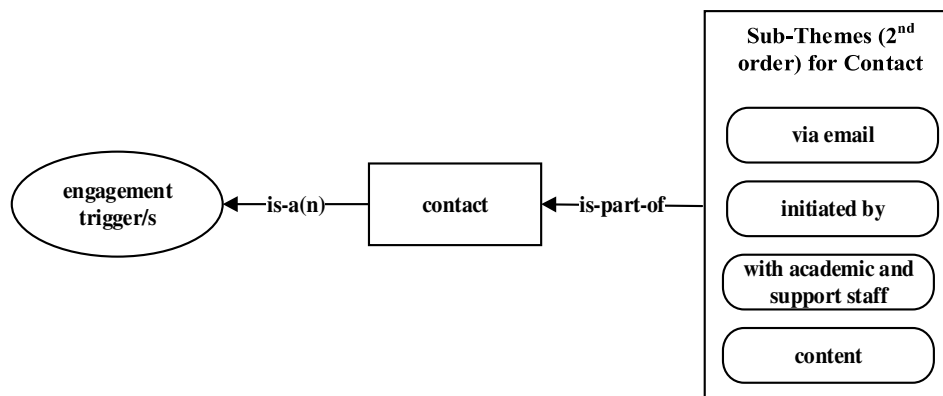
**Figure 11:** The thematic map. Ellipse show the main theme ‘Engagement Triggers/Identifiers’, rectangular box show the 1<sup>st</sup> order sub-theme ‘Assessment Types’ and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes



**Figure 12:** The thematic map. Ellipse show the main theme ‘Engagement Triggers/Identifiers’, rectangular box show the 1<sup>st</sup> order sub-theme ‘Access Resources’ and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes

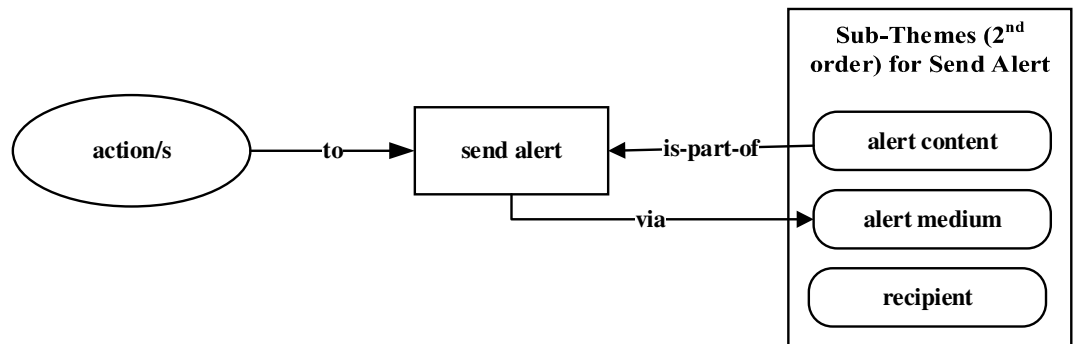


**Figure 13:** The thematic map. Ellipse show the main theme 'Engagement Triggers/Identifiers', rectangular box show the 1<sup>st</sup> order sub-theme 'Class Attendance' and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes

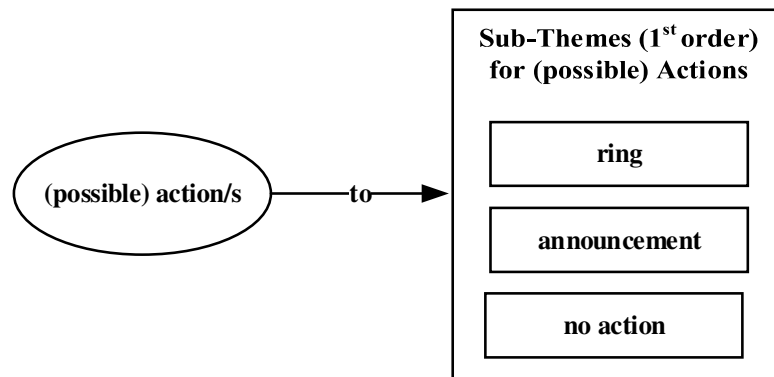


**Figure 14:** The thematic map. Ellipse show the main theme 'Engagement Triggers/Identifiers', rectangular box show the 1<sup>st</sup> order sub-theme 'Contact' and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes

## Thematic Map for the Main Theme: (possible) Actions



**Figure 15:** The thematic map. Ellipse show the main theme 'Actions', rectangular box show the 1<sup>st</sup> order sub-theme 'Send Alert' and rounded rectangular boxes show the 2<sup>nd</sup> order sub-themes



**Figure 16:** The thematic map. Ellipse show the main theme 'Actions', rectangular boxes show the 1<sup>st</sup> order sub-themes 'Ring', 'Announcement', 'No Action' for which there are no 2<sup>nd</sup> order sub-themes

## APPENDIX J

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### CASE STUDIES 5 SURVEY

#### Section I: Demographic Information

1.1 My student ID (8-digit) is:

1.2 The unit code for which I am filling in this survey is:

Dropdown list of units is included here.

1.3 I am:

- ☐ Male
- ☐ Female
- ☐ I don't identify as male or female

1.4 My age (in years) is:

- ☐ 18 or younger
- ☐ 19-24
- ☐ 25-34
- ☐ 35-49
- ☐ 50 or older
- ☐ Prefer not to say

1.5 My first language is:

- ☐ English
- ☐ Other than English

1.6 I am a(n) \_\_\_\_\_.

- ☐ International Student
- ☐ Aboriginal/Torres Strait Islander Student
- ☐ Neither

1.7 My student enrolment by course load is:

- ☐ Full-time
- ☐ Part-time

1.8 My student status is \_\_\_\_\_.

- ☐ First year, first semester student
- ☐ First year, second semester student
- ☐ Continuing student (2<sup>nd</sup> year, 3<sup>rd</sup> year or above)
- ☐ I came from another university
- ☐ Other If OTHER, please specify. \_\_\_\_\_

1.9 I am enrolled with the faculty of:

- ☐ Arts
- ☐ Business and Economics
- ☐ Human Sciences
- ☐ Science and Engineering
- ☐ Medicine and Health Sciences

1.10 On average, approximately how many hours did you spend per week on employment?

- ☐ < 5
- ☐ 5 - 10
- ☐ 11 - 15
- ☐ 16 - 20
- ☐ > 20
- ☐ Not working

## Section II: Early Alerts

**NOTE: An “Early Alert” is a message, feedback or contact to students initiated by the teaching staff regarding students' academic performance in a unit.**

2.1 Would you like to receive early alerts about your performance? Explain why?

2.2 For what specific behaviours do you want to be contacted?

2.3 If you were asked for permission for your data in iLearn, or other academic data held by university, to be used to identify and send early alerts about your performance, would you:

- ☐ Agree
- ☐ Disagree
- ☐ Not sure

2.4 Which of the following factors, if any, impeded your academic performance in this unit? (Mark all that applies)

- ☐ Family responsibility/commitments
- ☐ Mental health
- ☐ Emotional health (lack of motivation, fear of failure etc.)
- ☐ Physical or health disability
- ☐ Financial issues
- ☐ Felt under-prepared for this unit
- ☐ Issue with the teaching staff
- ☐ Lack of student academic support
- ☐ Religious commitments/activities
- ☐ Social coping skills
- ☐ Problems with daily travel
- ☐ Paid work commitments
- ☐ Other If OTHER, please specify. \_\_\_\_\_

2.5 Were you contacted by a teaching or student support staff at any stage about your academic performance in this unit?

- ☐ Yes
- ☐ No

If No is selected, then skip to end of the survey. Is there anything else ...

2.6 Did you follow-up or take any action as a result of being contacted?

- ☐ Yes
- ☐ No

If No is selected, then skip to 2.8 what was your attitude receiving...

2.7 What specific action(s) did you take when you were contacted?

2.8 What was your attitude receiving an early alert or intervention?

2.9 Did receiving an email from your teaching staff change how you studied for this unit? If so, please provide details. What did you change or do differently?

2.10 What impact did receiving an email from your unit teaching staff have on your motivation to continue in the unit?

2.11 When you were contacted, were you advised to seek help from any Macquarie University campus support services?

- ☐ Yes
- ☐ No

If No is selected, then skip to end of the survey. Is there anything else ...

2.12 Did you actually access any campus support services after receiving an email from your unit teaching staff?

- ☐ Yes
- ☐ No

If No is selected, then skip to end of the survey. Is there anything else ...

2.13 Which campus support services do you visit? (Mark all that applies)

- ☐ Financial aid services
- ☐ Disability service
- ☐ Counselling service
- ☐ Welfare service (financial aid services, academic progress issues)
- ☐ Chaplaincy service
- ☐ Numeracy centre
- ☐ Health and wellbeing service
- ☐ Learning skills program
- ☐ Career & Employment service
- ☐ Education services for overseas students (ESOS)
- ☐ Academic Advice
- ☐ Tech Help
- ☐ Ask.edu.au
- ☐ Other If OTHER, please specify. \_\_\_\_\_

2.14 Is there anything else you would like us to know?