Web 2.0 affordances to support collaborative learning in higher education

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Abstract

Technology plays a significant role in higher education and much emphasis has been given to the technology itself rather more than the effectiveness of its application for learning. Many scholars agree that an effective learning activity should enable learners to think and act upon the object of learning. Furthermore, in a socially-situated learning context, the social negotiation and renegotiation processes are as important as the individual cognitive processes. This importance is further emphasised by the rise of socially-enabled Web 2.0 technologies which connect learners in ways previously not possible. Thus, knowledge no longer just exists in the mind, but also in the discourse and social relationships which bind those individual and socially negotiating minds; and in the artefacts they produce and consume during that discourse. Therefore, there is a constant construction and negotiation between components of a learning activity.

All the discussions mentioned above challenge educators to adopt the same technology that has changed students' social interaction, into an effective learning tool. This study offers a practical framework to empower educators in the design and evaluation of technology usage as part of their students' learning. It explores socially situated collaborative learning as an activity system including a community of learners within a specific learning context. The context formed by customs, history, rules, law, and roles, influenced the learners as active agents supported by Web 2.0 affordances to produce artefacts and achieve meaningful learning outcomes.

Through three case studies in computing and education, the study observed and interviewed students about their use of wikis in different collaborative learning activities, students' expectation and familiarity towards the technology itself; and the interplay between personal perception and group discovery of technology affordances.

Although there are many practical findings from the study, and some are not unfamiliar to academics, the study discovered that the process of imparting technology use to students in collaborative learning settings is a two-step process of (1) inspiring the perceptive senses of students and (2)

nurturing group work dynamics within the team to induce an atmosphere that promotes perceived affordance of the tool into practical utilization that benefitted the entire group. This discovery would inform academics in our approach to encourage technology mediated collaboration in our teaching.

The study observed that different technical affordances were being used in response to the needs of the collaboration activity being conducted. This confirms the argument which promotes the uses of a set of tools rather than a single individual tool to support collaboration needs. Factors such as students' clarity of the tasks and positive expectation of what the tool can do for them based on their past experiences also contributed positively to the perception of the affordances.

Contrary to commonly held perceptions that academics have little influence on the way students use technology in their learning, the study indicated that there is a significant role that academics can take in particular, when influencing perceptions of affordances and scaffolding the experience with technology during the design and teaching stages of a unit. Academics' traditional role, such as nurturing a conducive environment for positive group work dynamics also contributed to this extended role. Although a hands-off approach from the academic can lead towards accidental success, this study suggested well designed and purposely enacted interventions would lead to better learning outcomes.

Statement of Candidate

I certify that the work in this thesis entitled "**Web 2.0 affordances to support collaborative learning in higher education**" has not previously been submitted for a degree nor has it been submitted as part of requirements 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. 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 Macquarie University Ethics Review Committee,

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I would like to dedicate this thesis to my father who did not see it started,

to my mother who did not see it finished,

and above all to my God who see me through the journey.

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Andreas U Kuswara

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1 The Research Problem

1.1 Overview

Aristotle argued that a human is both a social and solitary being, thus there are activities that we do in solitude and activities that we can only do with the company of others (Mulgan, 1974). Learning is no exception; although learning can be both individually and socially enacted, even individual learning activities, such as self-reflection and deep-thinking cannot be done completely in isolation. This is because the experiences we reflect upon and the thoughts we think are all situated within a social context or the product of social discourse. Broadly speaking, therefore, we can say that learning is predominantly a social activity acquired through lived experiences with the environment, including people, and the act of teaching-learning is the act of conversing and interacting with others, of forming a collaboration between a teacher and student (Tharp, Estrada, Dalton, & Yamauchi, 1999; Vygotsky and Cole, 1978).

The above mentioned perspective on learning is also clearly seen in John Hattie's 15-year-long meta-meta-analysis of 800 meta-analyses, which consisted of 50,000 research articles involving 240 million students (Hattie, 2009). Hattie discussed the factors that influence students' learning achievements at school in Australia. He classified 136 factors into six groups, namely, student, family, school, teachers, curricula and teaching approaches; He discovered that 'teacher' had the strongest effect (0.49) while 'school' had the weakest (0.23). Effect here is the *effect size*, which is a statistical measure indicating the magnitude of the effect one factor has on, or the response it obtains from, the targeted objective. The effect is measured in each of the studies within a meta-analysis to provide a "common currency" for comparison of the results across studies (Koricheva, Gurevitch, & Mengeresen, 2013).

Hattie's finding is not new, and it re-emphasises what many educators already know; that the teacher is the active change-agent in the learning-teaching process. His findings argued for educators to take an active and deliberate role in creating and sustaining a supportive and collaborative atmosphere of trust between teacher and students as well as among students. This argument is critical for meaningful discourse to occur (Hattie, 2009, 2012; Terhart, 2011). Learning is not done merely through a simple transaction where the one who knows fills in the others who don't; rather, learning comes from the discourse between two knowing and even two unknowing individuals (social constructivism).

In this regard, technology has been an enabler, which connects large number of people through different modes, media and devices. One particular technology is the Internet, which since its inception just a few decades ago, has continued to advance in its sophistication and grow exponentially in transaction volume. The Internet and the various services built onto it have become extremely effective and efficient in connecting and affording richer discourse with which to underpin collaborative activities.

Since its inception in the 1960s, the Internet has evolved considerably. What was the original web, now labelled as Web 1.0, today has become Web 2.0. A web which consists of a plethora of tools, programming languages, protocols, infrastructure and services that shape and continue to reshape the way we buy and sell things, the way we socially connect and interact with each other, and also shaping the way we learn and teach.

The trend is primarily driven by the improved speed and accessibility of Internet connection and by the increase in the number of students and institutions with access to powerful hardware. With more users connected to the Internet, its utility rate has increased, and therefore Internet-based innovations have flourished. The Internet is suddenly no longer just a collection of contents waiting to be consumed by passive consumers, but has now become a place where like-minded people can connect and collaborate to produce, co-produce and consume each other's contributions. This is the essence of this phenomenon coined "Web 2.0" (O'Reilly, 2005).

What Aristotle perceived then has been intensified by the hyper-connection that the Internet offers now. More people are getting connected than ever before, thus allowing connections to be made quicker and more economical than previously possible. The bandwidth of that communication channel is getting bigger, allowing richer data to be exchanged between participating entities, such as video formats and interactive media. The connected devices at either end of this channel are also getting smarter, allowing sophisticated uses of data, such as spatial data, that was previously either limited or not possible at all. Obviously, these advancements excite educators and innovative initiatives spring to life to make use of existing tools to help learning; but the crucial challenge is more on how to make appropriate use of the new affordances that are offered by the technology, rather than the technical marvels themselves.

Although the focus of many educators in the field has tended to gravitate around the technology, recent research attention has moved away from looking just at hardware, software and infrastructure features and shifted back to teachers and learners as the primary stakeholders in the use of technology (Lim and Chai, 2008). Jonassen, Peck and Wilson (1999) rightly stated that technology should be used to pursue meaningful learning and to support the learner's learning engagement. Therefore, research in the field should investigate how technology can support the exploration and construction of knowledge, as well as support learning by doing, conversing and reflecting (Jonassen, 2000a). To achieve this, we have to look at adopting technology at a meaningful level within the framework of a learning activity rather than be captivated by operation of the technology for its own sake.

At the time of this study, in 2008-2009, the use of Web 2.0 tools within formal education in Australia was at a relatively early stage; however, government and the private sector have been promoting and supporting the deployment of Information and Communication Technologies (ICT) infrastructure in education sectors throughout the country.

During 2008-2009 there was a large investment in Canada, US, Mexico and Britain to implement Interactive Whiteboards (IWBs) in schools (Holden, 2010). The expansion of that market then targeted the South Pacific region, including Australia, and we saw the investment made by schools to place IWBs in classrooms with their *"connected classroom"* promotion. Many benefits were observed from this investment; both students and teachers were more excited about the teaching-learning process and students paid more attention and took a more active part in the lessons. We also discovered, however, that those benefits did require some other pre-requisites for success, not necessarily unique to IWBs, such as school leadership support, clear instructions and, in particular, capable and passionate teachers (Gursul and Tozmaz, 2010; Winzenried and Lee, 2012). As Hattie argued, teachers who are competent in using the technology and are passionate about it and can use it well bring about improvements in the teaching-learning process, while teachers who are not competent with the technology face a struggle additional to their pre-existing load (Hattie, 2012).

In 2008, New Media Consortium published the 'Horizon Report', which listed technologies and social shifts in the use of technology that were the stepping stones for the growth of Web 2.0 (*The 2008 Horizon Report*, 2008). Grass-roots video foresaw the ubiquity and affordability of production and distribution of video-based content for both social and academic purposes; we now see how dynamic the social discourse is in and around video production and consumption. Collaboration-web was also a phenomenon that the report predicted in 2008-2009 for both the workplace and education settings.

> *The essential attribute of the technologies in this (collaboration-web) set is that they make it easy for people to share interests and ideas, work on joint projects, and easily monitor collective progress. (The 2008 Horizon Report, 2008, p.14)*

In the higher education sector, the use of Learning Management Systems (LMS) has been growing in quantity and scope, but it has its challenges. Academics have to overcome technical barriers by learning to use the software and teac in mixed-mode that combines the traditional face-to-face approach with technology mediated-learning; administrators have to implement the support systems across the institution (Weaver, Spratt, & Nair, 2008).

As with IWBs and other technological implementations, many early Web 2.0 adopters in the education sector claim to have reaped benefits from it. However, many publication indicated that of those adopters then made positive claims about their experimentations without strong evidence or lacks in-depth conceptualisation to explain relationships between technology and other components involved in learning activity, such as content design, communication strategy and students' expectations of learning (Kirkwood, 2009; Mason and Rennie, 2008b). Many claims also lacked adequate explanation about how the tools were actually used to support the teaching and learning process and what benefits these tools offered compared to more traditional tools (Lim, 2002; Ullrich, Borau, Luo, Tan, Shen, & Shen, 2008). Teachers who have sound conceptual and operational understanding of how the technology can support their teaching is one of the factors that Hattie used to differentiate between the "good" and the "bad"; in the context of Australia and New Zealand, one report stated that," ... many teachers do not have the skills to make effective use of emerging technologies, much less teach their students to do so" (Johnson, Levine, & Smith, 2008, p. 3).

Becoming familiar with the tool itself is a challenge. It is even more of a challenge to conceptualise it into a schema within an existing education structure (Bower, Hedberg, & Kuswara, 2010).Thus, it is the more technology-aware educators who are more inclined to use technology to expand their teaching and learning approach in the class (Cavas, Cavas, Karaoglan, & Kisla, 2009; Deniz, 2005; Ozelkan and Galambosi, 2012). However, being technologically savvy does not necessarily mean that the technology is adopted and adapted appropriately for teaching; this research claims that it is frameworks that can help educators avoid being trapped by the eye-catching characteristics of the tools and move towards a deeper understanding of how and why the tool can support the learning process (Ellis and Goodyear, 2010; Gosper, 2011).

There is a need, therefore, for a framework to conceptualise the use of technology as part of a wider ecosystem and take into account the interactions embedded in a socially-constructed collaborative environment of teacher and students. Although the work that Hattie did was in the K-12 sector (Hattie, 2012), the need to assist teachers to be better prepared for an active role in the teaching-learning process applies equally to the higher education sector. This can be achieved partly by making use of available Web 2.0 tools to build trust within the digital environment and allow meaningful discourse to underpin learning.

Such a framework needs to conceptualise the rich relationships between the tool, the teacher as active player and a community of students who interact with the learning contents and discourses during the learning activity. It needs to serve as a means for educators to evaluate the suitability of particular Web 2.0 tools to support their teaching activity and help them make informed decisions. This is preferable than prescribing a rigid set of "right ways", as such approach will allow greater involvement and ownership of the product (Bower, 2008).

The framework can then be used to inform educators when deciding which tools to use for their teaching and can also help them evaluate existing tools to identify possible weaknesses and thence further product development.

1.2 Technology in learning

1.2.1 Web 2.0

First, the phenomenon awkwardly termed Web 2.0 will be examined. The name was first coined in a brainstorming session and no clear definition was attached to it. It was simply an expression to mark a turning point after the dot-com bubble burst. The term was poorly thought out; the numerical "2.0" designation, which would normally indicate a subsequent major release of a new software version to replace an old one, was misleading because both Web 2.0 and the traditional web can co-exist, serving different purposes.

The new label was based on observations of new, web-based, applications that share similar characteristics (O'Reilly, 2005). Table 1 shows the distinction between the new characteristics and the old. The new characteristics, labelled “Web 2.0”, represent a more *social-centric* approach, while their traditional, or original, counterparts, which were later conveniently re-labelled as “Web 1.0”, are more *content-centric*.

Table 1. Contrasting Web 1.0 and Web 2.0 by observation, adapted from (O'Reilly, 2005)

Basic service:	Web 1.0	Web 2.0	New characteristics:
Online advertisement	**DoubleClick**	**Google AdSense**	Dynamic advertisement based on the page content
Photo sharing	**Ofoto**	**Flickr & MySpace**	Personalised templates, tagging, annotating & comment
Website	**Personal Websites**	**Blogging**	
File Sharing	**Akamai**	**BitTorrent**	Peer to peer source & each downloading machine becomes server
Music sharing	**mp3.com**	**Napster**	
Online encyclopedia	**Britannica Online**	**Wikipedia**	Open content & collaboratively written
Online event organizing	**Evite**	**upcoming.org & EVDB**	Event request & comments from collective users
Identity	**domain name speculation**	**search engine optimization**	Marketability
Visitors volume	**page views**	**cost per click**	Navigation behaviour
interfacing two programs	**screen scraping**	**web services**	Merging into 1 platform: The Web.
Centralized authorship	**publishing**	**participation**	Democratization of authorship
Centralized managed content	**content management systems**	**wikis**	Open content
Pre-defined	**directories (taxonomy)**	**tagging ("folksonomy")**	User-defined
Single provider	**stickiness**	**syndication**	Federated provider

Among the key differences was the shift to view the web as a platform, and the fact that it harnessed the collective intelligence of its users. The web was no longer merely a medium of communication between applications, but itself an application, with *connectedness* embedded into the application. Participants were no longer just consumers of content, but also prosumers (producer + consumer), giving rise to the user-generated content trend that has given users a richer and more empowered role (Giurgiu and Barsan, 2008). Even the usefulness of the services is now judged by looking at the number of people who use the tool and contribute to it, rather than simply counting the number of people who view its contents.

Table 1 shows the trend of a global change that has penetrated various aspects of human life, including education. When people read the news they are no longer just passive recipients who consume the news; instead, they want, and even feel compelled, to voice their opinions. This shift in social perception is quite profound, one that has shifted the very underpinning of our understanding about how consumers and learners behave and carry out transactions, be these in a trade context or in one of collaborative learning.

In 2006, *TIME* magazine interestingly chose 'You' as its 'Person of the Year', and called Web 2.0 as an "interesting massive social experiment worth trying".

> *Who are these people? Seriously, who actually sits down after a long day at work and says, I'm not going to watch Lost tonight. I'm going to turn on my computer and make a movie starring my pet iguana? I'm going to mash up 50 Cent's vocals with Queen's instrumentals? I'm going to blog about my state of mind or the state of the nation or the steak-frites at the new bistro down the street? Who has that time and that energy and that passion? The answer is, you do. (Grossman, 2006).*

Today, we can see that this phenomenon, which has been piggy-backed onto the growing Internet connectedness and the constant improvements in the quality of Internet connections, has redefined many aspects of human life. At its core, Web 2.0 is still just a collection of tools, but these tools have been able to extend social interactions and relationships well beyond physical boundaries (e.g., Facebook), connecting people with the same interests (e.g. LinkedIn, Pinterest), creating virtual communities (e.g., MySpace, Google+) where people can share each other's thoughts, learn from each other and contribute artefacts such as text (e.g. Wikipedia), pictures (e.g., Flickr, Instagram), audio (e.g., Voicethread), video (e.g., YouTube and HowCast), browsing history (e.g., Del.icio.us and Stumbleupon), and annotated web pages (e.g., Diigo), in a collaborative way and on a scale that was not possible before, even though it had been envisioned by Vannevar Bush in 1945:

> *"The human mind ... operates by association. With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts, in accordance with some intricate web of trails carried by the cells of the brain ... Consider a future device for individual use, ... is a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory"* (Bush, 1945).

The hyper-texting of contents and the mobility of personal devices that act as our extended memory as well as the portal to vast amounts of information was already envisioned by Bush in 1945, and back then it was considered science-fiction. However, it clearly exists today and it is influencing the way we live and learn. The question now is; how can we utilise available technologies most effectively to support learning?

1.2.2 Learning activity

Leont'ev stated (1972, cited in Jonassen, 2002) that the process of learning and the activity of learning interact with each other as they are inter-dependent. He meant that when learning, the learner cannot act without thinking, nor can he or she think without acting upon the product of his or her thoughts. Therefore, for a learner to be able to learn well, it is necessary for that learner to think and act on some objects through a particular action.

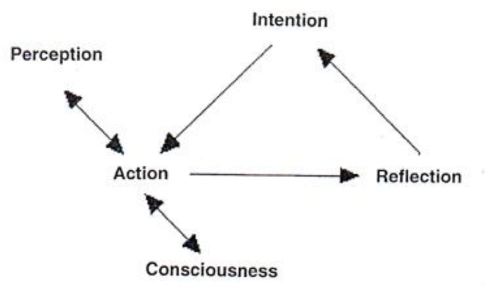

Figure 1 Learning as intention-action-reflection (Jonassen and Land, 2000, p.v)

Jonassen and Land (2000) summarised this relationship within the context of meaningful learning; they characterised learning actions as being influenced by and influencing the perception and consciousness of the learner. In addition, they said that learning action has a reciprocal relationship with intention and reflection (Figure 1); with intention we plan our actions, then we act upon them. This is followed by reflection on those actions against the original intention and during this 'thinking cycle', learning occurs.

Jonassen and Land (2000) framing highlights the relationship between the learning objectives (*intention*), the thinking processes (*reflection*), and the learning activity (*action*). Therefore, to consider how technologies can most effectively support learning activity, attention must be given to the intention and reflection processes involved in that learning activity.

This study acknowledges learning as a set of complex meaning-making processes carried out through cognitive and physical interactions between a learner and the learning community. There are many components involved in a learning activity. Learning is a socially-negotiated process or social-dialogical process rather than an isolated cognitive process. If we put this against the rise of socially-enabled Web 2.0, we can see the potential for the effective use of Web 2.0 to underpin the social-dialogical process of learning.

We also see that knowledge exists not only in the individual and socially-negotiating minds, but is also formed within the discourse, the social relationship that binds it with the artefacts consumed or produced. Therefore there is a constant cycle of construction and renegotiation between the components within a learning activity, to form the intention that is then fulfilled through actions (Engeström, 2002).

It is an emerging challenge for educators of today to use the same technology that has changed the way students interact socially and reapply it effectively to enable meaningful knowledge construction and promote positive learning experiences for students.

1.3 Aim of the study

This study attempts to contribute to the body of knowledge by providing a framework to conceptualise technology usage (rather than technology usage itself) by looking at it as part of an ecosystem. This ecosystem is not just the technology but also the teacher and the students' ecosystem. This framework is aimed to empower educators in their design and evaluation of technology usage in their teaching.

To quote Jonassen and Land (2000, p.vi);

> *... to investigate a learning phenomena, we are obligated to consider not only the performance of the learners, but also the socio-cultural and socio-historical setting in which the performance occurs and tools and mediation systems that learners use to make meaning.*

This study therefore used a socially-situated collaborative learning activity as the object of observation, placed within a community, and contextualised by learning objectives. It looked at the learning activity itself as a system with its own customs, history, rules, laws and roles that influenced the learner as an active agent of learning, mediated by tools to produce artefacts and achieve meaningful learning outcomes, as depicted in Figure 2 (Jonassen and Land, 2000).

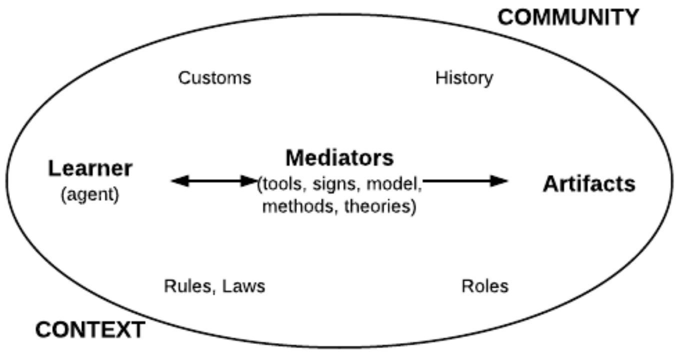

Figure 2 Learning in context (Jonassen and Land, 2000, p.vii)

The study investigated the relationship between one of the Web 2.0 tools, the 'wiki', and a collaborative learning strategy that aimed to support meaningful learning within the context of problem-solving at a higher education level.

Although ideally a broader representation of various Web 2.0 tools would be more beneficial to the study, due to limited resources and available cases to work with at the time of study, the study had to focus on one tool. The 'wiki' was selected to represent Web 2.0 tools as it is the only tool that contributes to most categories within the Framework for Web 2.0 Learning Design (Bower, Hedberg, & Kuswara, 2010, pp.190-191). The versatility of wiki has allowed it to be all pervasive and to be used in various ways.

The application of activity theory, affordance and problem-based learning theories provided a suitable foundation on which to build the conceptual framework. The application of all three was used to guide this study, as well as to lead it towards a wider ecosystem view to assist educators in incorporating Web 2.0 tools more effectively into their instructional design. Thus, within the context of tertiary undergraduate study at an Australian university, this study explored the following questions:

- what affordances does the wiki offer to students undertaking collaborative learning tasks?
- what learning discourses do these affordances support?
- how do students perceive those affordances and use them in their collaborative learning activity?
- what influence do academics have in this process in inspiring the use of wiki for collaborative activities.

This study approached the questions by investigating several case studies in a city university's programs. Both qualitative and quantitative data were collected to facilitate the discovery of (a) the factors in learning activity and (b) the affordances of wiki that were perceived from the students' perspective.

1.4 Outline of the thesis

The outline of this thesis can be seen in Figure 3, which shows this research study consists of three case studies. Hence, the thesis is written in such a way as to present the overarching introduction, literature review and methodology first, followed by the discussion of each case study, before closing with an integrated discussion about the framework and conclusion.

Chapter Two is the literature review, where literature pertaining to the research is discussed. A more specific literature review, however, is also provided within each case chapter to provide more grounding on the context of that particular case study.

Chapter Three is the presentation of the research methodology, which is again explained in general where relevant to the case studies as a whole. Specific discussion regarding each case has been added to each case chapter.

Chapters Four, Five and Six are the presentations and discussions of each case study. Each chapter is written as complete in itself for the particular case study, allowing the reader to review the findings more easily and to simplify the flow of discussion. The discussion of the subsequent case studies is not built from the previous one; rather each case is examined separately and common themes are gathered and teased out in the discussion in Chapter Seven.

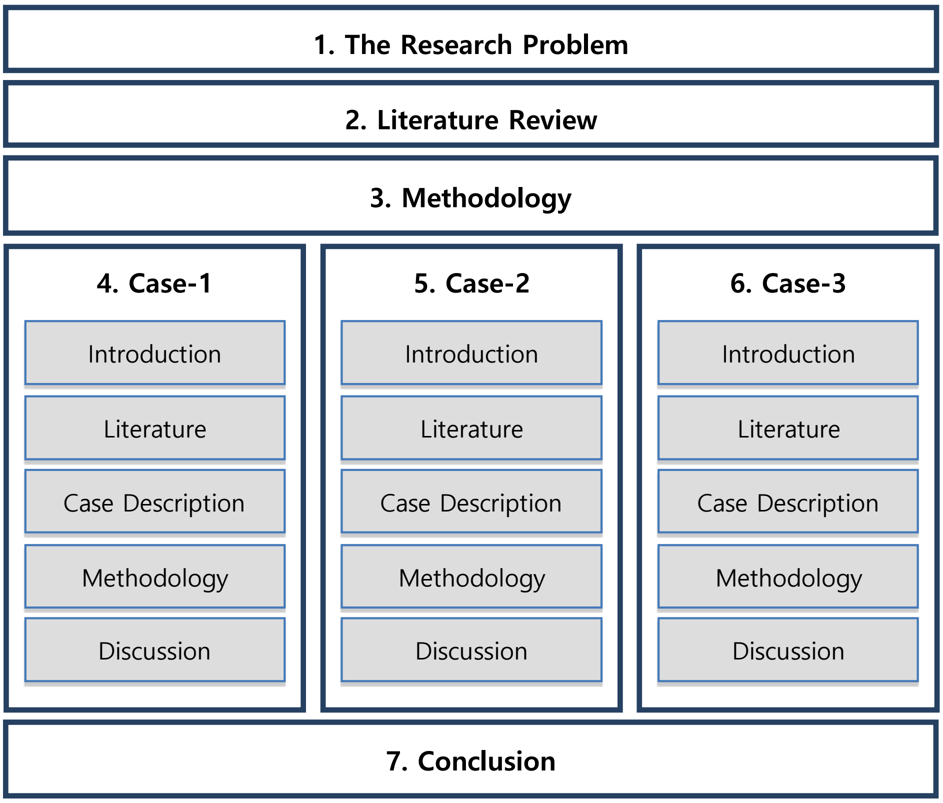

Figure 3 Outline of Thesis

Chapter Seven is an integrated discussion of all of the case studies and contains further conceptualisations towards forming the aimmed framework. This chapter is then followed by a brief conclusion and provides suggestions for further study.

Because the three case studies (Chapter 4, 5 and 6) were structured and presented independently of each of the other, thus it is possible for the reader to read this thesis omitting two chapters of the three case study chapters: Chapter 4, 5 or 6, without loosing any relevant information (E.g. Chapter 1, 2, 3, 4, 7 or Chapter 1, 2, 3, 5, 7).

2 Literature Review

2.1 Introduction

This chapter begins with an exploration of collaborative learning, what kind of activity is involved in collaborative learning and how learning occurs within a collaborative setting. In the second section, several relevant topics on pedagogy and cognitive aspects of learning are discussed to provide some conceptualisation of the learning process relevant to the study. Dillenbourg (1999) stated that it requires neither the state of being alone nor being in a collective cause for learning to occur, but rather the activities done either individually or collaboratively that trigger learning. In peer interaction, the individual cognition process is not suppressed; rather the existence of peers adds extra cognitive processes due to the additional activities required in engaging with peers.

The third section explores the changes that the Internet has made to learning contexts and how they impact on educators. The fourth section investigates the theories involving affordance and the attempts made to classify affordances to promote their practical use among educators and education researchers. In the last section, activity theory is unpacked and followed by discussion on how it can be used as a framework for the analysis of a dynamic context that has several components acting upon it.

Further literature reviews are presented at the beginning of Chapters 4, 5 and 6 to contextualise each of the case studies. Each chapter respectively presents the findings of case studies 1, 2 and 3. These literature reviews are considered necessary to provide specific background for each case study and are thus presented with each relevant case study to retain cohesion of presentation.

2.2 Collaborative learning

The word “collaborative” has been paired with the word “learning” to describe various approaches to learning with peers. Countless educators and researchers have attempted to define the word, but the best conclusion is probably that stated by Pierre Dillenbourg (1999) in the introduction to an edited book titled "Collaborative Learning: cognitive and computational approaches". In this book, he concluded that he could not come to a conclusion about the definition of the word. Instead, he presented various views and approached the term from various perspectives such as: students' interactions that produce learning through rich verbal exchanges when co-constructing elaborated explanations; resolving epistemic conflicts through discussion; negotiating meanings and eliciting mutually-agreed regulation processes (Dillenbourg, 1999; Dillenbourg, Huang, & Cherubini, 2008).

2.2.1 Cooperative learning

It is difficult to discuss "collaborative learning" without mentioning "cooperative learning", a phrase with which it is often used interchangeably. Confusion was encountered when attempting to distinguish between the two. Some educators and researchers consider them synonymous, or at least define both loosely enough that the two coincide (Ifenthaler, 2011); other researchers draw a strict distinction between the two terms (Barkley, Cross, & Major, 2005; Roberts, 2005); and yet others, such as Dillenbourg, are content to leave the term 'cooperative learning' undefined (Dillenbourg, 1999).

An article by Kenneth Bruffee presented an epistemological argument that the two learning approaches actually erode each other's aims (Bruffee, 1995). He contrasted the endeavour of cooperative learning to reduce competition and promote individual learner's accountability with the aim of collaborative learning, which shifts the learning responsibility from teacher to students and thus empowers students more in their social interaction within the group.

In fact, the two approaches can be differentiated according to such factors as the degree of involvement of the teacher, the power and authority relationship between teacher and students and how knowledge is assimilated or constructed (Barkley, Cross, & Major, 2005; Bruffee, 1995; Dillenbourg, 1999; Lopez-Benavides and Alvarez-Valdivia, 2011; Matthews, Cooper, Davidson, & Hawkes, 1995; Roberts, 2005). Those who favour the cooperative learning approach would generally agree that teachers need to assume control continuously and actively over the learning process, monitoring what has been learnt and how it occurred. Such an approach might hint at the existence of a "correct" answer held by the teacher to be revealed at the end of the learning exercise. On the other hand, those who adopt a collaborative learning approach tend to avoid such propositions. Wholly believing that knowledge is the product of social construction, they fully expect and trust the students to be independent and active in their construction of knowledge.

However, the similarity between the two is that both approaches view learning as active and constructive. Thus, while teachers should take a more active role rather than be mere broadcasters of information (Hattie, 2012), at the same time, a greater responsibility is demanded from the students, requiring social skills in addition to learning the content because learning is also a social activity of participating in a discourse.

Some researchers presented the notion that cooperative learning is an approach more suitable for younger learners in the K-12 levels, while collaborative learning is considered to be better suited for learners at the college and higher education levels because it requires more maturity on the student's part to be independent and present their own opinion as part of their knowledge construction (Bruffee, 1995; Matthews, Cooper, Davidson, & Hawkes, 1995).

This study is positioned at the higher education level where students are considered to be sufficiently mature to take responsibility for their own learning, to negotiate their workloads and collaborate in their tasks.

2.2.2 Situated learning

Another important concept is "Situated Learning" which was originally proposed as a model for learning by Jean Lave and Etienne Wenger (1991). It is important because it gives the connection between learning and the context where that learning occurs as well as the context where the learning objective will be attained.

The model was originally presented, not as a pedagogical strategy, but rather as a model for adult learning in a community of practice. However, since then it has been taken up by educators and researchers to support various pedagogies that include situated activity. It suggested that students learn better through the process of socialisation, visualisation and imitation of others when they explore real-life situations and solve problems (Hung, 2002; Lave and Wenger, 1991). Cobb and Bowers (1999) further elaborated on the meaning of "situated" by comparing different views on situated learning with views on cognitive learning. They stated that situated learning does not imply simply a physical context or location, but a much larger context of learning engagement and relevance. This is in line with the views of many educators who advocated a shift in schools' role in education, as described below.

Schools used to be perceived as a place where knowledge or experts reside and where knowledge or experts could be accessed by those who learn. Thus, students would expect teachers to be the subject matter experts in every topic they learn. This perception was established to serve the needs of the industrial age to produce standardised university graduates to fulfil specific pre-defined roles in the workplace. From the 18th to the early 20th century, graduates were likely to remain in their role for a considerable length of time performing the same task and requiring the same set of skills with minimal changes over time. However, due to technological and socio-cultural changes, the workforce of today is likely to demand agile university graduates who can fulfil more than one type of role, or, at the very least, are flexible enough to move from one role to another, even if within the same organisation.

The rapid expansion of connectivity, Internet capabilities and relevant services have intensified the situation and not necessarily in a negative way; rather, they disrupted the relatively unchanged academic playing field forever. Students now have access to enormous resources of knowledge and content online, placing them on somewhat the same footing as their teachers in this respect. Their exposure to content can no longer be controlled by the teacher or the school.

Therefore, the new role for schools is to be a place that can facilitate learning processes (Groundwater-Smith, Le Cornu, & Ewing, 2007) sensitive to the different needs of each learner, which in turn adds emphasis to the importance of well-designed learning activities.

2.2.3 Components of collaborative learning

Amidst the potential confusion caused by various schools of thought, concepts, definitions and practices surrounding collaborative learning, this study attempts to define collaborative learning so that the role of collaborative learning can be more clearly defined in the findings.

As Pierre Dillenbourg (1999) explained, collaborative learning varies widely in its interpretation because of the three main parts in its definition of *who*, *what* and *how*.

- **Who.** Who is the learner and how many of them are participating in the group? Whether it is a pair of students; a small group of three to five; a community of tens or hundreds; the whole world; or anywhere in between. One could be described as "peer-learning", while another as "the wisdom of the crowd"; they are all collaborative.

- **What**. What learning activity are they engaging in? Whether students are learning through solving problems, getting involved in lifelong work practice or constructing a piece of computer system, the activity is a mechanism that allows learning to occur. There is a wide range of learning activity approaches that can be drawn out. However, because learning itself is not the end, but rather the means to achieve an end, we do not engage in a learning activity for its own stake. Students participate in a learning activity because they are aiming to reach their learning objective. Therefore, a learning activity done by an individual needs to be meaningful and relevant to that individual's intention to 'do' learning, as well as relevant to the broader goal of the learning itself, as designed by the educator (Barkley et al., 2005; Jonassen, 2002; Soller and Lesgold, 2007), and situated within realistic contexts that are meaningful for the students.

- **How.** How do the modalities and modes of collaborative learning take place, face-to-face or tool-mediated, synchronous or asynchronous? This factor describes the togetherness in a collaborative learning situation. Advancements in technologies, such as Web 2.0, strongly influence the way we interact in social life and learning.

Therefore, effective collaborative learning is a socially situated learning approach which should enable students to actively engage in the learning process and make cognitive connections between facts, ideas and associations and to organised these into a meaningful relationship. The more tightly those facts, ideas and associations are connected in the student's mind, the more the student can achieve "deep"– as opposed to "surface" — learning (Ramsden, 1991).

2.3 Meaningful learning

Contrary to the approach of "situated learning", Novak (2002) pointed out that high *situativity* can deprive students of the ability to transfer their learnt knowledge from one context to another, rendering their academic achievement fraudulent or inauthentic. Although Novak's conceptualisation of "situated learning", later referred to as "situated cognition" (Novak, 2002), which is probably rather different to what Cobb and Bowers (1999) had in mind, Novak introduced the notion that meaningful learning occurs on a continuum rather than a memorisation-by-repetition approach to learning; or *rote learning*.

As seen in Figure 4, the meaningful-learning continuum is determined by the quantity and quality of relevant prior knowledge that the learner already possesses, and the degree of his/her effort to integrate new knowledge with existing, relevant knowledge. Thus, Novak suggested that the less prior knowledge a learner possesses, and the less effort he/she makes to connect what is being learnt with that existing knowledge, the less meaningful the learning is to that learner. His view accorded with Shuell's suggestion that phases in meaningful learning occur gradually over a period of time (Shuell, 1990).

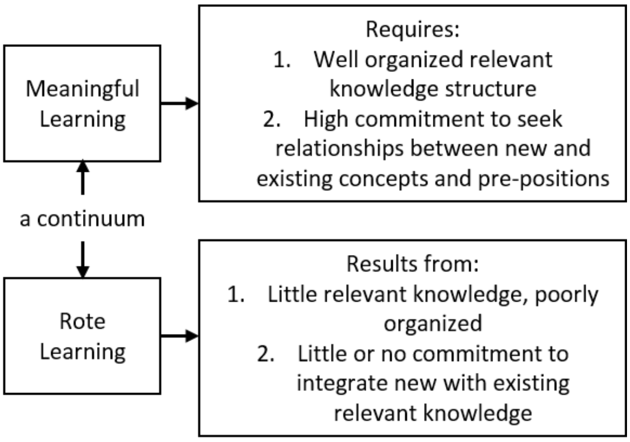

Figure 4 Meaningful learning continuum (Novak, 2002, p.552)

While Novak attempted to explain the intrinsic factors that influence an individual's meaningful learning, earlier work from Jonassen and Land (2000) provided an explanation of the activities that actually make learning become meaningful. They depicted socially-mediated cyclic activities of intention-action-reflection (Figure 1) and underpinned their explanation by viewing learning as an activity that involves a community and that interacts with the environment (Jonassen, 2002). Jonassen also argued that because meaningful learning is tied to activity, the more authentic and purposeful the activity is, the more likely it is that meaningful learning will result. In a later work (Jonassen, Howland, Marra, & Crismond, 2008) characterised meaningful learning as active, constructive, cooperative, authentic and intentional (as seen in Figure 5).

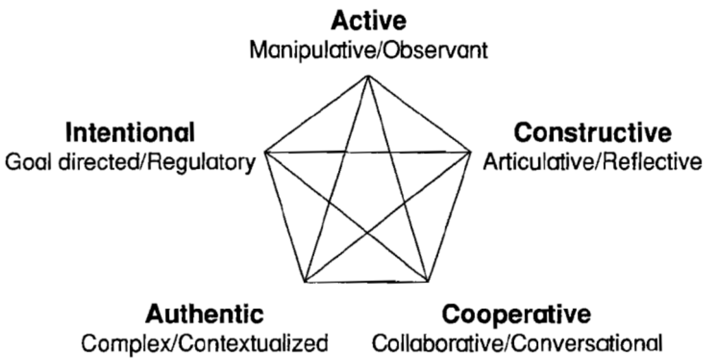

Figure 5 Characteristics of meaningful learning (Jonassen, Howland, Marra, & Crismond, 2008, p.3)

Therefore, this study sought cases where the wiki tool was used to mediate collaboration in solving learning tasks that were active, constructive, cooperative, authentic and intentional.

“Active” means that students have the chance to manipulate the objects and tools then observe the impact of their action and make further adjustments to their action. The tasks need firstly to involve a community with whom the student will have to interact and negotiate their actions as a component in the learning activity; and secondly to use wiki as the tool to mediate this negotiation, because it allows sufficient transparency for all participants to observe others’ actions and improve their collaboration processes as a whole. Jonassen et al. (2008) argued that being active is insufficient on its own to make a task meaningful. Students need also to be able to articulate and express their confusion and mental processes as they integrate their prior knowledge with the new experience, and thus construct their own understanding.

The task also needs to be “intentional”, which means it needs a clear goal, communicated to all the participants, to make the whole collaboration itself meaningful. This clarity would then ideally also be expressed by participants in the way they use the tool, the wiki, in their collaboration.

The task naturally needs to be “collaborative”, or whatJonassen et al. (2008) interchangeably refer to as “cooperative”. The task should involve a discourse and negotiation as well as re-negotiation through the knowledge-building process, where each participant’s work is dependent on the others and vice versa.

Lastly, the task has to be “authentic”, not a simplified, stripped-down version, but rich with context. Therefore, it cannot be easily resolved through the application of some fixed and known formula, but must involve a journey of problem solving, which reflects most real-world contexts.

2.3.1 Problem-based approaches

To support the five characteristics of meaningful tasks, in particular the authenticity, a learning activity needs to have an alignment between its formal setting, where knowledge is acquired during learning, and a real-life setting where the knowledge will be applied (Bennett, Harper, & Hedberg, 2002; Cobb and Bowers, 1999), a problem-based learning approach offers that alignment.

As many have argued, problems provide a purpose for learning and problem-based learning can offer more integrated, better retained and more transferable knowledge towards capability-building by placing learning within the context of a meaningful task (Boud and Feletti, 1997; Hmelo-Silver, 2004; Jonassen, 2007). Many educators regard development of problem-solving skills as an important learning outcome and a central point of education that trains learners to be better problem solvers (Gagné, 1985; Jonassen, 2000b).This is certainly in line with the demand for agile graduates, as mentioned earlier, who not only need to be attuned to a specific, pre-defined situation, but can also assess situations and apply problem-solving skills to arrive at a solution.

There are different types of problems and each type provides unique learning experiences (Jonassen, 2000b) and has different structure, complexity and domain-specificity (Jonassen, 1997). Therefore, to fully understand the dynamics within a group as they solve problems by technology, we need to look at different types of problems:

- An *Ill-structured problem*, such as strategic performance, case analysis, design problems and dilemmas, is a problem type closely related to constructivism and situated cognition, because it involves creating unknown solutions within a certain context and focuses more on the articulation and argumentation of decisions rather than on finding the correct and efficient solutions.

- A *Well-structured problem* has specific and known paths that can be followed to arrive at one of the intended solutions because there are limited possible solutions that can be produced.

As Jonassen (2000b) said, each of the two types of problems require different support. Figure 6 unpacks this discussion further by depicting various ill-structured problems in the top half of the diagram, and the various methods of reasoning that can be drawn from existing schemas are listed in the lower half of the diagram. This diagram shows that certain reasoning approaches are better suited to addressing certain types of problems. For example, analogical and causal reasoning in solving ill-structured problems, if tied by coherent arguments, are the basic building blocks for comparing and understanding propositional relationships among problem examples to solve some particular types of problems. (Jonassen, 2007). Looking at Figure 6, we can appreciate the complex discourse happening between participating members during problem-based collaboration that underpins the requirements for technology which will be discussed later.

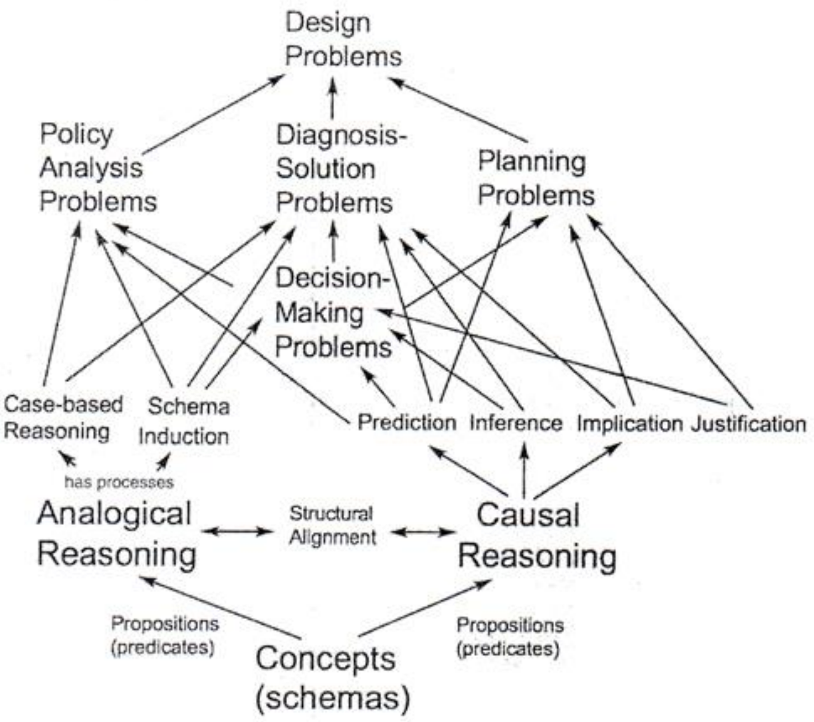

Figure 6 A taxonomy of meaningful learning (Jonassen, 2000b)

The discourse within a group as it negotiates the problem-solving tasks can be unpacked further by looking at the Problem-Based Learning (PBL) cycle suggested by Hmelo-Silver (2004) (Figure 7).

Hmelo-Silver (2004) unpacks the group problem-solving effort starting with (1) identifying facts from the given problem scenario where students attempt to represent the problem according to their own understanding. Once some understanding is established, students can then formulate and analyse the perceived facts using critical and creative thinking and then (2) generate their hypotheses about the possible solution of the problem. The next step is what Hmelo-Silver identifies as the crucial step, where students need to (3) identify their own knowledge deficiencies through intense collaboration with their peers; each student's perspective of these deficiencies represents their own learning issues which they need to resolve in their self-directed learning. Once they complete that step, students (4) produce and apply the new knowledge, adding to their shared understanding and (5) evaluate to repeat the steps by identifying new facts which have not previously been identified or by generating new a hypothesis through their discourse, which hopefully eventually leads to consensus for a solution.

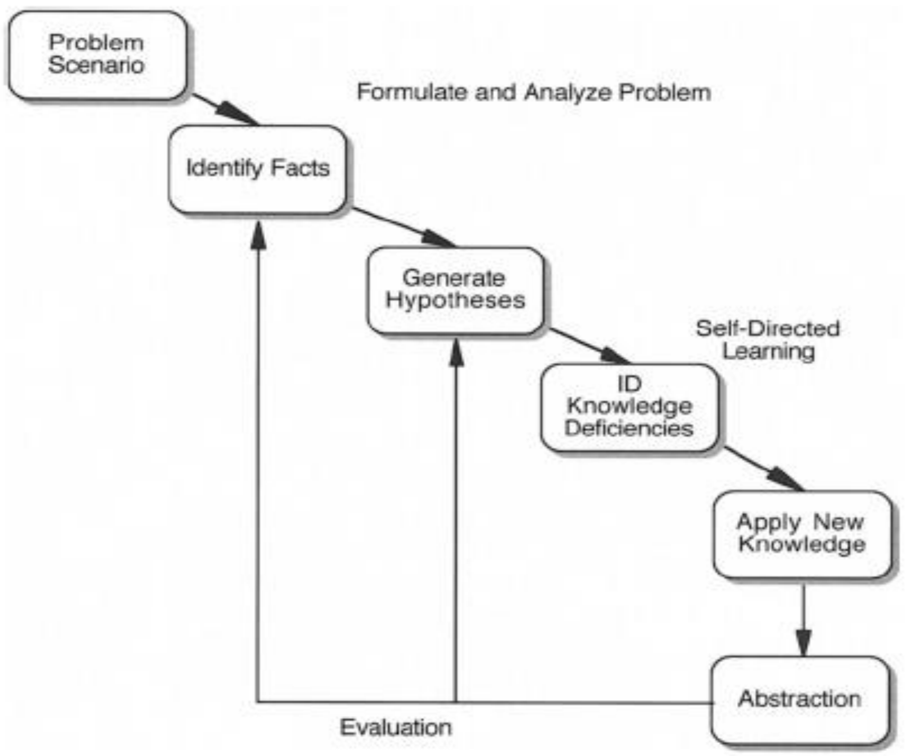

Figure 7 Problem-based learning cycle (Hmelo-Silver, 2004, p. 237)

Hmelo-Silver also called this diagram a Problem-Based Learning tutorial process, because this is how the author envisioned what the PBL designers had in mind about what the students do when they design the PBL tasks. This study investigated how the underlying tool performed during the collaborative PBL activity.

Koschmann, Kelson, Feltovich and Barrows (1996) offer a slightly different perspective on the problem-based learning process. As seen in Figure 8, they break it down into five components of cognitive processes that do not transition linearly from one to the other.

Koschmann, Kelson, Feltovich and Barrows model this framework according to the way a skilled practitioner conducts problem-solving processes and represents actions which a set of tools can provide to support students.

From both Hmelo-Silver's and Koschmann, Kelson, Feltovich, & Barrows (1996)'s frameworks of problem-based learning processes, this study acquired general underpinnings to describe the interaction involved in wiki-mediated problem-based learning collaboration.

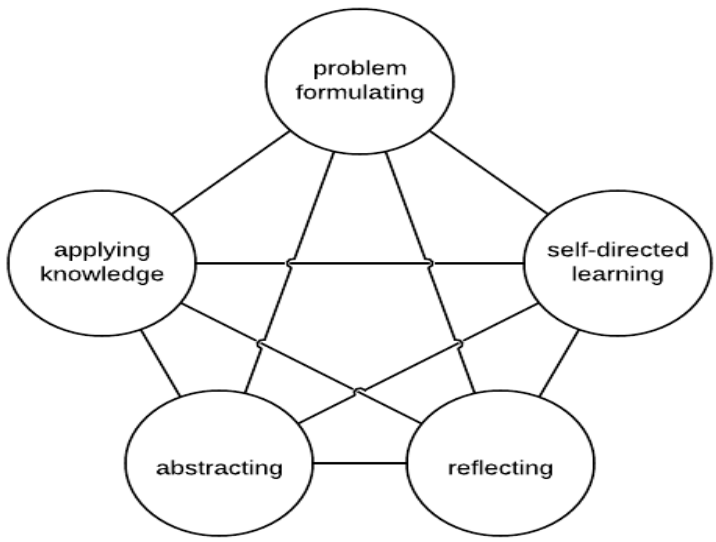

Figure 8 Components of PBL (Koschmann et al., 1996, p.98)

2.3.2 Critical thinking

As explained in the previous sections, there are several thought processes behind a problem-solving learning activity as students gradually progress from perception of the problem-state to intermediary states and finally enter the goal-state (J. R. Anderson, 2000). These thought processes form a complex interactive system rather than stay as a collection of separate skills; unpacking this complex system gives us better understanding of the needs of individual participants in any collaborative problem-solving activity. They are collectively called critical thinking and consist of three main thinking systems (Iowa State Dept of Education, 1989; Jonassen, 2000a):

- The *content* or *basic-thinking system* consists of the process of learning and retrieving what was learned and includes the skills, attitudes and dispositions required to learn the new information. This thinking involves the general process of problem solving, designing and decision-making, and it interacts constantly with critical and creative thinking because it is the knowledge base from which these last two operate.

- The *critical-thinking system* consists of thoughts that enable the individual to evaluate and make judgements based on certain standards, analyse and differentiate interrelating parts within a construct and make meaningful sense out of the relationship, and connect or identify causal relationships and other linkages between elements. Together, they influence how a learner perceives new knowledge and "consumes" and integrates it with existing knowledge.

- Lastly, the *creative-thinking system*, which goes further than simply accepting or contradicting knowledge, is the thought process that drives the production of new knowledge. This system includes synthesising, imagining and elaborating ideas, information, processes, outcomes and possibilities to put elements together to form a coherent or functional whole (Anderson, Krathwohl, & Bloom, 2001; Krathwohl, 2002).

The critical thinking conceptualisation is also aligned with the revised Bloom's taxonomy presented by Anderson and Krathwohl (2001), where the level "create" was introduced as the highest level of learning objective in the cognitive process dimension, as shown in Figure 9.

Looking at their work from the critical thinking perspective, it can be seen that the learning outcomes of remembering, understanding, applying, analysing and evaluating are strongly supported by learners' critical thinking capabilities. The addition of an explicitly defined "create" learning objective acknowledges the cognitive-constructivist perspective to learning.

If both concepts are placed within the meaningful learning context of the Vygotskian view, then the creative process becomes part of a larger community's collective knowledge-construction activity. Here each individual learner engages both critical and creative thinking processes to organise and re-organise stored knowledge as well as to create new knowledge to be shared with others in the community in collaborative spaces.

the knowledge dimension	the cognitive process dimension					
	1. Remember	2. Understand	3. Apply	4. Analyze	5. Evaluate	6. Create
A. Factual Knowledge						
B. Conceptual Knowledge						
C. Procedural Knowledge						
D. Meta-Cognitive Knowledge						

the knowledge dimension	
A. Factual Knowledge	Aa. Knowledge of Terminology
	Ab. Knowledge of Specific details & elements
B. Conceptual Knowledge	Ba. Knowledge of classifications & categories
	Bb. Knowledge of principles & generalizations
	Bc. Knowledge of theories, models & structures
C. Procedural Knowledge	Ca. Knowledge of subject-specific skills & algorithms
	Cb. Knowledge of subject-specific techniques & methods
	Cc. Knowledge of criteria for determining when to use appropriate procedures
D. Meta-Cognitive Knowledge	Da. Strategic knowledge
	Db. Knowledge about cognitive tasks, including appropriate contextual & conditional knowledge
	Dc. Self-knowledge

the cognitive process dimension	
1. Remember	Recognizing
	Recalling
2. Understand	Interpreting
	Exemplifying
	Classifying
	Summarizing
	Inferring
	Comparing
	Explaining
3. Apply	Executing
	Implementing
4. Analyze	Differentiating
	Organizing
	Attributing
5. Evaluate	Checking
	Critiquing
6. Create	Generating
	Planning
	Producing

Figure 9 The revised Bloom's taxonomy (Anderson, Krathwohl, & Bloom, 2001, pp. 32, 46, 67)

2.4 Learning in a digital world

In this section, learning as a technology-mediated activity, the changes that the Internet has brought to learning and its impact on the role of educators will be explored.

2.4.1 Learning as construction

According to Perkins (1992a), there are three basic goals in learning, namely, retention, understanding and application. *Retention* is when a learner learns new things and then displays the ability to retain what was learnt in his or her memory. Hence, it is mainly a storage and retrieval process of knowledge and forms the very basic process of learning. *Understanding* requires the learner to take a step further by adding an element of deep thought to make sense of the stored knowledge, or to comprehend it, and then display that comprehension of the subject to an audience. Lastly, *application* is the ability to apply the acquired skills and knowledge in meaningful and useful ways to resolve a problem at hand. The three are a progression of what to do with the learnt knowledge. In the practical world, *application* is usually praised highly for being the ultimate purpose and is the reason for acquiring knowledge in the first place. As discussed earlier, Perkins's *application* is aligned with Anderson and Krathwohl's (2001) higher-order learning and Jonassen (2000b) meaningful learning.

While these are the aim for some designers, achieving that goal requires a deliberate process, as suggested by Problem-Based Learning Cycle (Hmelo-Silver, 2004) and The three-stages learning process of (Duffy and Jonassen, 1992). The latter authors viewed learning as a series of processes starting from knowledge acquisition and progressing from there according to the complexity of knowledge acquired (Figure 10). At the early stage of learning, learners who have limited prior-knowledge or skills are likely to reap benefit from a well-structured instructional learning approach that scaffolds their learning. As they learn and develop their competencies more, they begin to accept more complex knowledge and are able to solve *ill-structured* tasks.

Figure 10 Three-stages of learning process

Duffy and Jonassen (1992) explained that this problem-solving process is primarily done by retrieving knowledge from existing memory and re-applying it to the given situation. Therefore, if the process is mediated by technology, a storage and retrieval system will be required by participants, in particular to store and retrieve information related to the problem-solving cycle previously explained by Hmelo-Silver (2004).

Because the accumulation of prior knowledge occurs throughout the learning process, be it at the knowledge acquisition stages or the expertise stage, learners have a greater advantage in their learning if they adopt a constructivist instead of an instructional approach (Duffy and Jonassen, 1992; Perkins, 1992a). This is because the constructivist approach requires the learner to cope with both the cognitive complexity of managing tasks as well as developing *buy-in* (affective aspect) of their learning process. Furthermore, this learning approach can be done within an authentic context and have greater impact than the passive taking in of instructions. The literature supports the notion that there are changing needs as the collaborative process progresses, that is, from a transactional store-retrieve process to a more constructive discourse-building from participants' contributions in order to achieve the intended goal.

This constructive approach is not something new to educators. Looking back to the early work of Jean Piaget (1967), work that was later termed *cognitive constructivism*; Piaget believed that learning is a knowledge construction process that can only be performed by the individual learner through personal experience. He also conceptualised knowledge as being constructed by human minds rather than as pre-existing concepts waiting to be discovered (Dimitriadis and Kamberelis, 2006).

Bloom's taxonomy of learning

In 1956 a committee of educators chaired by Benjamin Bloom proposed a taxonomy for classifying learning objectives. The taxonomy was later called Bloom's Taxonomy of Learning, which was intended to promote holistic learning by covering all three domains: cognitive, affective and psychomotor. The cognitive domain is further broken down into six levels of learning which are grouped into two: lower and higher order thinking/learning. As each level is attained and the prerequisites of the lower levels are satisfied, a learner can progress to the higher levels (Bloom, 1956).

The levels of the cognitive domain, or what is loosely described as *knowing*, are knowledge, comprehension, application, analysis, synthesis and evaluation. The first three levels are considered to be lower-order thinking; the last three are considered higher-order thinking.

Bloom's work was later revised and clarified by his former students, Anderson and Krathwohl (2001), in order to make it more practical for educators to use. The revised taxonomy is a two-dimensional taxonomy combining the original *Knowledge* and *Cognitive* domains with the new *Knowledge* and *Cognitive Process* dimensions (see Figure 9). The Knowledge domain is described using nouns, while the Cognitive Process domain uses verbs. This separation was done to avoid any confusion resulting from the dual nature of the original knowledge domain (Krathwohl, 2002).

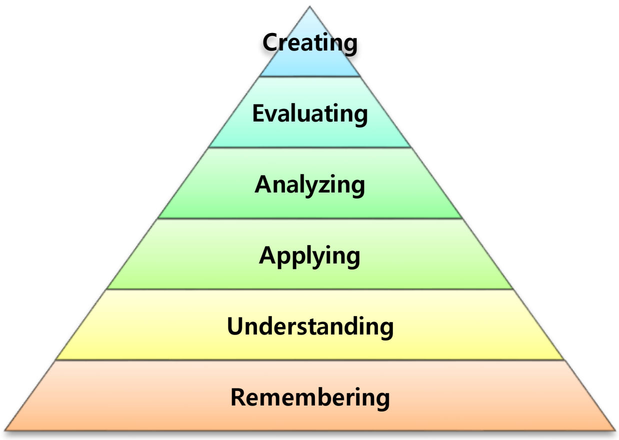

Figure 11 The revised Bloom-taxonomy-cognitive process (adapted from Anderson et al., 2001)

The new cognitive process domain is deconstructed into levels in a similar manner to the original cognitive domain. These levels are: remembering, understanding, applying, analysing, evaluating and creating (Figure 11). Krathwohl explained that the consistent use of verbs would simplify things for educators when using the framework to design and classify instructional and learning activities based on their objectives.

The work that Bloom started and that Anderson and Krathwohl continued is significant because it helps educators to specify learning objectives as part of either their assessment or their design strategies. Whether educators are preparing their instruction by thinking ahead to the goal of learning, or conducting and progressing their class towards that goal, the Bloom's taxonomy serves as a reference compass for them.

Digital learning vocabulary

Many educators are overwhelmed by the increasingly pervasive presence of technology in daily life. They find their classes are invaded by the various technologies brought by students into class, they are pressured by the global trends and enticed by the promised benefits of using these technologies. How can educators negotiate the use of these technologies in the classroom? Do educators have to ban all technology in the classroom to protect the status quo and keep the teaching-learning processes happening as they have been? Some have tried to do just that and failed.

Since most educators are familiar with and accustomed to Bloom's taxonomy, there are attempts to reconcile these influencing forces; through the work of Andrew Churches (2008), we observe an attempt to map the properties of the new digital tools directly with the learning objectives previously described by Anderson and Krathwohl (2001).

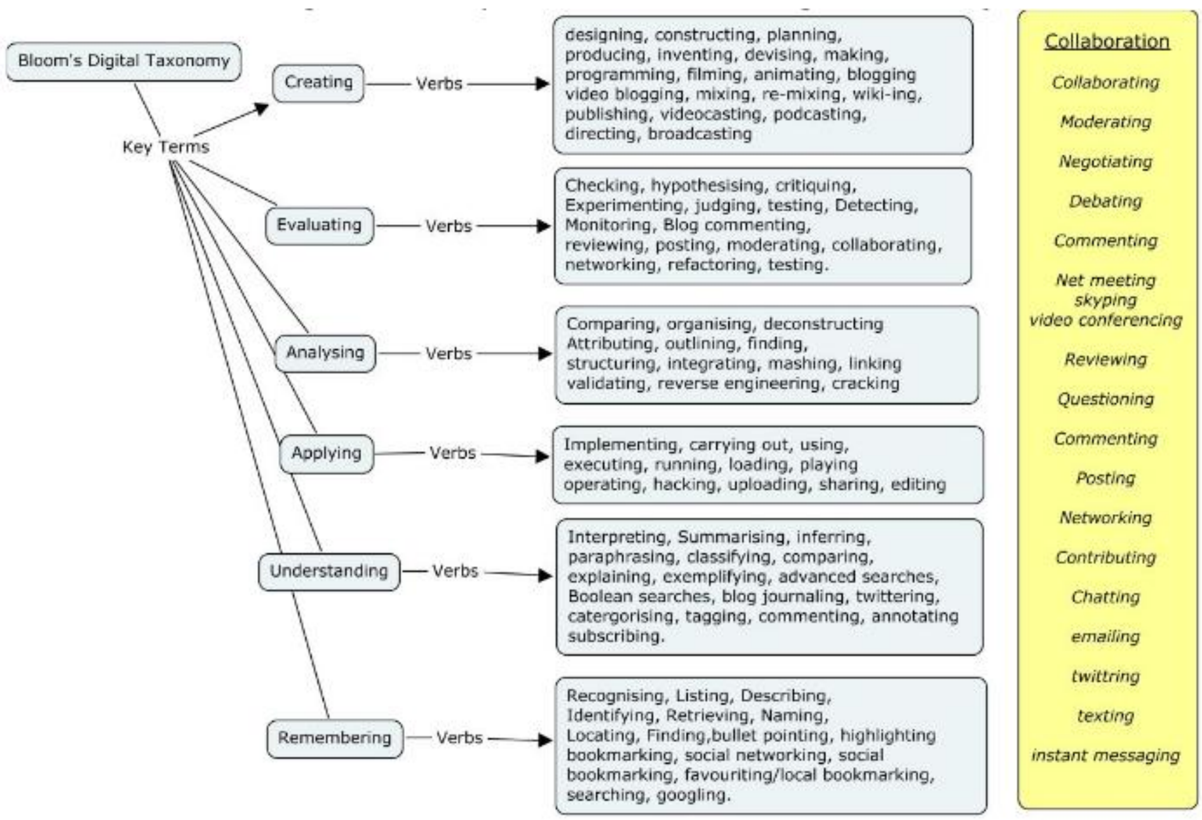

Figure 12 Mind map of Bloom's revised digital taxonomy
(Churches, 2008, Retrieved from http://www.techlearning.com/article/8670)

Bloom's taxonomy of learning, which consistently describes learning objectives using verbs, was modified with the advent of Web 2.0, by replacing the verbs with technology-enabled verbs (see Figure 12) (Churches, 2008). These additions to the vocabulary highlight the various roles and contributions Web 2.0 can make directly to enable a learning activity (Bower, Hedberg, & Kuswara, 2009).

Towards construction

With the advent of Web 2.0, one of the significant changes that we can and will likely continue to observe is the social shift in the view of the content authority, especially in relation to academic content authority (Chang, Kennedy, & Petrovic, 2008; Simon, 2010). Content authority used to be limited to a small number of privileged individuals who could publish their work and then have it consumed by a mass audience. With the development of the Internet, however, practically anyone can be a publisher. There are various opinions on this matter, including whether what recently became known as the *wisdom of the crowd* is something in which we can put our absolute trust. Probably not, as the study conducted by Chang, Kennedy, & Petrovic (2008) discovered that students do not have full confidence in the content produced by their peers; they still have greater trust in content produced by lecturers. Nevertheless, the underpinning mindset has begun to change from learning as a consumption of knowledge to learning as a creation process, and it is happening in a much more profound way than before the advent of Web 2.0.

This change favours the promotion of higher order learning outcomes and socio-constructivist learning approaches. Learners are now, more than ever, empowered to create and share what is produced in a mutual-consumption cycle, a cycle in which learning can be cultivated and nurtured. Because knowledge is also produced collectively and learning becomes an activity which involves a community of learners, learning is no longer just an individual process.

2.4.2 Learning as social activity

While the basic principle of Piaget's individual constructivism remains relevant, the ever-increasing interconnectedness of today's world makes it a bit out of date. Vygotsky's work added a critical social aspect to the picture. His views presented the concept that knowledge is a product of a community, and people socially construct new knowledge through the process of accommodation and assimilation of their collective experiences, rather than in isolation (Dimitriadis and Kamberelis, 2006; Prawat and Floden, 1994; Sosa, 1991). Vygotsky also highlighted the convergence of social and practical activities in learning as one of the most significant aspects of intellectual development (Vygotsky and Cole, 1978). Thus, communication and social activities were regarded as integrated and a critical part of learning.

The concept of socially constructing knowledge can only be experienced through practical activities where learners experience the construction of their own meaning at an intra-personal level. They connect this meaning with their inter-personal world by sharing with the rest of the learning community through multi-modal communication. Learners with different skills and backgrounds can collaborate in tasks and discussions to arrive at a shared understanding of the constructed truth in a specific field (Duffy and Jonassen, 1992).

Thus, learning is not a process that takes place only inside the learner's mind; nor is it a passive development of behaviour. Rather, it is an active process that occurs when an individual learner engages in social activities with other learners. This process becomes even more meaningful when the various conversations move towards mutual understanding (Greeno, 1998; Jonassen, 2007; McMahon, 1997), which usually sits within a context of solving a specific problem or responding to a situation. Although meaningfulness can be understood to include a feeling of self-gratitude – meaningful to oneself – it may also be understood to mean mutual understanding and so meaningful to society.

The approach of learning as social activity is both more appealing to today's educator and more relevant to today's learners, as it helps learners to develop the skills needed to meet future workplace and professional demands. For decades, many studies conducted in the US revealed that there was an increasing demand from employers for candidates who could display critical thinking, complex reasoning and well-developed communication skills (Arum and Roksa, 2011; Autor, Levy, & Murnane, 2003). The studies also showed a decrease in demand for candidates with narrow skill-sets that focused only on manual and routine cognitive tasks.

Considering the significance of the role that a community plays in building meaningful learning, the framework that we use to design collaboration needs to include the community component, and must be able to show the various discourses between the individual learner and the learning community.

2.4.3 Learning as design

From the designer's or teacher-as-designer's perspective, educators need to consider various characteristics of meaningful learning activities in order to allow socially constructive learning to occur. Duffy and Jonassen (1992) presented several characteristics that are required for a learning activity to become meaningful:

- First of all, *Active*. An active learning activity is one that allows learners to manipulate objects, either physical or conceptual, and interact with the environment. This will encourage learners to develop their own interpretation and understanding through observing experimentation and phenomena.
- *Constructive*. A meaningful learning activity needs to be more than just a matter of remembering and retrieving information from memory. It should allow learners to experience and integrate the interpretations of those experiences with their existing knowledge in order to form new knowledge.
- *Intentional*. This signifies that the learning activity needs to have learning goals that can be clearly articulated and communicated to learners. Intentional activity requires students to be prepared and focused in their endeavour.
- *Authentic*. Authenticity can be achieved by designing the learning tasks around real-world or simulated-real-world situations. This provides an opportunity for learners to take multiple roles and to experiment with different perspectives as they collaboratively construct knowledge within the specific roles. Authentic learning activity enables learners to reflect on and articulate their experiences, especially with coaching and scaffolding to guide the process, and it concludes with authentic assessment (Herrington and Herrington, 2006).
- *Cooperative*. The degree of cooperation in a learning activity is in-line with the Vygotskian view of designing a meaningful learning activity. It is where learners need to be able to experience working in a group, socially negotiate tasks and common expectations, as well as understanding, with their peers, and resolve misunderstanding and conflicts relevant to their endeavour to accomplish the goals.

The interconnectedness that Vygotsky suggested has been considerably amplified with the recent phenomenon of socially-focused Internet usage. This has given educators opportunities to explore socially-situated learning in ways that have not been possible before. Mediating web tools both support and enable such social dynamics. At the same time, the learning design process that promotes a social-constructivist approach becomes less straightforward compared to the instructional approach of learning. For educators to design effective learning in such an environment, it is necessary to frame the influencing factors in a practical way to assist their design and to allow consistency in their deliberation.

Designing with technology

The work by Churches (2008) was one of the initial steps in "making sense" of the digital context in which we live. His attempted to bridge the digital divide that existed in educators' minds when attempting to adopt the various technologies and incorporate them into their learning design.

However, the nature of Web 2.0 tools are somewhat unique. They rarely offer a single way of use. Thus, most Web 2.0 applications cannot be conveniently categorised as exclusive from other uses (Bower et al., 2010). Each tool usually offers a set of affordances that can be used to support different types of learning activities, depending on the needs of the activity itself. Web 2.0 developers also become more aware of social constructive needs, as there are more newly developed products which offer various affordances to address a wider range of collaborative needs. This is especially the case when it is possible to combine – or *mesh-up,* as it is known in Web 2.0 jargon – several tools to offer a new set of affordances that the individual tool cannot offer on their own.

On the flip side, although it's likely that more than one tool can offer the required affordance suitable to address the needs of a single learning design, there will be fewer tools that can support those particular needs well. Thus there is flexibility for educators in mapping their learning design needs and features of the tools, then pick the best-fit options for their design.

Activity theory

The activity theory published by (Engeström, 1987), as shown in Figure 13, provides a base for conceptualisation needed to help educators design their learning activity. This is because activity theory provides a rich set of lenses that help users to understand and guide them in the analysis and design of meaningful, situated, collaborative learning (Jonassen and Rohrer-Murphy, 1999; Nardi, 1995; Yamagata-Lynch and Haudenschild, 2009). Although Engeström's activity theory was originally developed for physical activity, where the actor manipulates a physical object, many educators have adopted this theoretical framework to study learning processes (Brentsen and Trettvik, 2002; Engeström, 1999a; Jonassen, 2002; Lim and Chai, 2008).

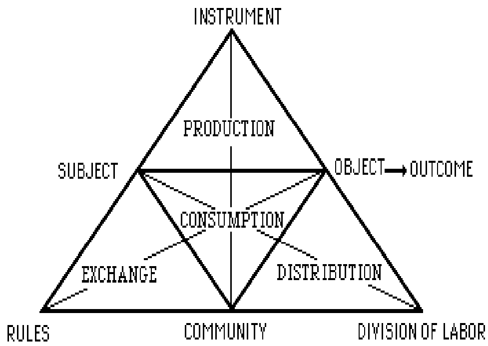

Figure 13 Development of human activity theory

The framework unpacks activity into four interrelated sub-systems labelled *production*, *consumption*, *exchange* and *distribution*. Each of these is a higher-order function and there is an interaction or relationship between the components, as illustrated by the points of each triangle in Figure 13 (Engeström, 1987; Holt and Morris, 1993; Jonassen, 2002; Jonassen and Rohrer-Murphy, 1999):

The *subject* is an individual learner or sub-group acting as a unit, which is selected as the point of view from which the activity is analysed. This means that when the activity theory is used as lenses to view an activity, the point of reference for analysis need to be pre-determined. In a collaborative learning setting, the point of reference can be an individual learner and the activity will be analysed from that person’s point of view. To represent the complete activity within a community, then the analysis can be repeated each looking from different individual learner within that community.

The subject is also recursive. For example, when analysing the dynamics within a group, we need to ask ourselves whether we are analysing the activity from the point of view of a single learner in the group, or from the point of view of the group participating itself as an entity within a larger class of multiple groups. Thus, depending on the intention of the analysis, the subject can be selected accordingly.

The *object* is the 'problem space' for which the activity is intended. It provides the reason for the activity to commence, and it will also become the reference to determine when the activity can be concluded. Therefore, it is the factor that determines the beginning state as well as the goal state of the activity. Once the goal state is achieved the activity could then be said to have produced the intended outcome of its existence. An object can be either physical or conceptual, expressed in the form of signs and symbols.

For each activity, the subject starts with a need to act, which is its motive (Engeström, 1999b; Kaptelinin & Nardi, 2006). This sense of need might start as an *un-objectified* object, or, as Kaptelinin and Nardi said, in the state of “seeking an object”. At this state, the subject knows he/she needs something, but does not yet know what that is. It is not always something physical, and can be psychological. Finally, the need would normally then be objectified, or in other words, the subject has identified something, an object, which he/she believes can satisfy that need. Thus, that object would be the embodiment of the need, and the subject will initiate the activity to pursue that object.

The choice of the particular object would largely depend on the subject’s perceived affordance of that object. For example, a woman needing to quench her thirst would seek an object to satisfy that need. When she sees a bottle of juice, and perceives the affordance of juice to be drunk, she would pursue that juice to drink. The juice has now become the object she pursues. The process of identification of object and then the initiation of activity can also be recursive. For example, in the previous illustration, when the subject wanted to pursue the juice for a drink, she might identify the need for a glass to hold part of that juice as there may exist some rules or constraints that make her refrain from drinking directly from the bottle. Thus, she would initiate a secondary activity to search for a glass once she has identified the glass as an object to pursue.

In a formal education setting, the object of the learning activity is somewhat given; it comes in the form of standardised learning objectives, or a description of the tasks or assignments. As in authentic problem solving, several steps would normally be required to complete the production process and achieve the desired deliverables. Hence, the subject would constantly shift between one activity and another to pursue the identified object, finally leading them to the fulfilment of the main objective.

The subject exercises the *production function* to transform the object through the use of an instrument or a *tool*; this can be a physical tool, conceptual (signs, symbols) or any combination of these. However, the subject is not alone in his/her effort to transform the 'problem space' into a solution; there is another subject or subjects which, from the point of view of the first subject, form the *community*. This community component is made up of other multiple subjects who are distinct but share the same object.

This community, together with the subject, consumes the produced objects; whether as an object produced by the subject and consumed by the community, or as an object produced by a member of the community and consumed by the subject. This is the *consumption function*. Collectively, both the subject and the community will reason and possibly scrutinise the object against their own individual thoughts. In the process, they may individually modify or create new objects through their own production functions, from their own respective point of reference.

In this community, each member makes his or her own unique contribution. This can depend on how the individuals distribute the tasks that they need to do (*horizontal division*) or it can be based on how much power, authority or status each individual possesses (*vertical division*). These divisions are recognised by the framework as the *division of labour* component that is influenced by the community and its individual members, as well as the shared problem-space they are working in. The actions involved in handling these divisions are called the *distribution functions*. Finally, the component *rules*, which are explicit or implicit, written or otherwise, in the form of norms or conventions, will constrain any interaction within the activity system and make up the *exchange functions*.

Depending on how complex an activity is, it can be broken down into other activities. For example, when the person in the previous example perceived the bottle of juice, she realised she needed to seek a container to pour the juice out from the bottle so that it could be drunk in a proper manner (according to rules or values). She therefore initiated another activity to seek a container, and so the container became the objectified need that she pursued. When she found the object that offered that affordance (e.g. a glass), then she could acquire it and ultimately satisfy the original activity.

2.4.4 Implication for educators

With the advent of the shift into a more constructivist approach, be this where students are socially situated to collaborate and negotiate their own conceptualisation of the world with their peers, or in the sense of the activity system just discussed, i.e., the "community", educators need similarly to change the way they teach from a transmission model to a model of self-regulated learning (Jonassen and Rohrer-Murphy, 1999). This has two implications.

First, teachers are relinquishing some of their *intellectual authority* due to the accessibility of various resources online, be these content or people. Additionally, because the demands of the profession have changed, learners need to construct their own meaning of the world more than ever before. Teachers can no longer be too instructive. Of course, this will be different depending on the level of education in which the educator is operating, but in all cases they need to assist students in gaining and developing knowledge or basic skills that allow them to operate on a more advanced level of knowledge acquisition. A teacher's role has shifted from being a simple knowledge transmitter to assisting students to discover the large community of scholars on a particular topic, and evaluating their own (the students') beliefs and understanding against the generally-accepted conventions, in other words, a journey that Perkins (1992b) called a "conflict-faced" path.

The second implication is relinquishing the *managerial authority* of learning. Teachers are no longer in full control of all the learning activity that learners can embark on, although sometimes they might be tempted to think they are. There are a significant number of resources available and relatively accessible to learners, which makes it close to impossible to determine what learners can and cannot know. This also means that learners can gradually become more "self-regulated" and responsible for managing their own learning tasks (Collins, Brown, & Newman, 1989; Perkins, 1992b).

While the challenges above are generic to any educator, the findings of this study are intended to help educators understand how the appropriate use of wikis can support any socially situated constructive collaboration activity in which students learn.

In this study, the meaningfulness of a learning process is viewed from the perspective of an individual student participating in a learning activity. The technologies and tools that the teacher selects to deploy are intended to enhance the student's learning experience. Improperly selected tools have the potential to hinder or distract students from the learning. Thus, a relatively good match must be acquired.

To connect Engeström's activity system to technology-mediation, this study adopts the concept of affordance, which is discussed in the following section. An elaboration of the relevance of affordance to activity theory is unpacked afterwards.

2.5 Affordance in learning

Looking into the relationship between tools and actions would mean looking into the relationship between the user of a tool and the tool itself, within the context of an activity (Norman, 1999). The concept of affordance is the study of such a relationship; it originated from a direct perception psychologist, Gibson (1977), and was derived from situation theory and ecological psychology

(Gibson, 1979; Greeno, 1998). Since its conception, the theory of affordance has been widely used in the field of Human Computer Interaction (HCI) (Gaver, 1991; Norman, 1988, 1998, 1999), before extending to other fields such as robotic systems (Duchon, Kaelbling, & Warren, 1998; Murphy, 1999; Şahin, Çakmak, Doğar, Uğur, & Üçoluk, 2007) and education (Bower, 2008; Brentsen and Trettvik, 2002; Conole and Dyke, 2004; Gaver, 1992).

The following section of the literature review will examine affordance theory according to its original context from two prominent schools of thought – Gibson's and Norman's – before merging both theories.

2.5.1 Affordance as perception

The word "affordance" was invented by a perceptual psychologist, J. J. Gibson, who used it to refer to actionable properties between a substance, such as an object in the environment, and an actor, which can be any living organism, either human or animal (Gibson, 1977). Gibson argued that the relationship that exists between an organism and its environment is complementary and any studies on the organism should be conducted in its natural environment rather than in isolation.

Gibson then coined and defined the word "affordance", about which he asserted, "The affordance of anything is a specific combination of the properties of its substance and its surfaces taken with reference to the animal." He assumed that if a set of properties of a substance are perceivable, then any subset of those properties would also be perceivable. In other words, it is not necessary for the substance to have the full set of its properties before it can be perceived. Gibson also formulated that it is easier to perceive an affordance of a substance in reference to the subject who perceives it, rather than attempting to identify objectively the full set of properties of a substance in isolation from the subject. He then made a judgement that it is more meaningful to understand the substance when the subject is used as a point of reference.

The statement above will be clearer with an example; Gibson used the example of a surface. If there is a surface whose properties include being rigid, level, flat, extended and located approximately at the height of the knees of a human biped, then such a surface would afford "sitting-on", or, could be said that the surface is "sit-on-able". Such objects then named as “seat”, “stool”, “bench” or “chair”. Once that conceptualisation occurs, it can then simply referd to as an affordance to "sit on" the chair, without having to describe the original five properties. If examined closer, the chair itself might actually have more properties than the five originally mentioned such as being heavy, having a wooden colour, soft surface, etc.; but not all of them need to be perceived in order to perceive that we can sit on the chair. The affordance of that chair to allow someone to sit on it is more meaningful when looking at it from our perspective as a human biped.

Gibson added further explanation throughout his work by giving examples of what he conceptualised as affordances such as stand-on-able, climb-on-able, get-underneath-able, fall-off-able, bump-into-able, etc., all of which are perceptions from the point of view of the human user. He considered this to be higher order thinking and a more meaningful way to describe the substance. Following this line of thought, Gibson defined affordance as a perception that is formed by the actor about what he/she can do in relation to the substance when he/she perceives a set of its properties.

Because perception is unique to a particular actor, a different person who weighs much more than the first would possibly see the same substance, but not perceive that he/she can sit on it because the substance would not offer sufficient support. Unlike animals, humans have the ability to perceive affordance and then alter the environment they live in; by altering the environment, they are changing its affordances, providing themselves with a new or additional set of affordances that would otherwise not be available. In doing so, humans are making the environment more meaningful for themselves.

Social context

Gibson also claimed that not only do humans have a relationship with substances in the environment, but we may also have a relationship with another human. He stated that what a human affords another human is the richest and most elaborate affordance that one can perceive. This richness is attributed to the human property, that is *animate*, which means that humans are capable of *initiating* movement, and interacting or responding to an action with another action.

Thus, in his words, Gibson stated that the behaviour of a single person affords further behaviour in another person. Gibson’s further discussion then enters the psychological realm, the depth of which is beyond the scope of this study. However, one of the aspects of Gibson's work that is so significant to teaching and learning – in particular in relation to the use of educational technology tools such as wikis to support learning activities – is the notion of affordance, including a social one, formed by the perception of an actor within a context that is meaningful to the actor.

Misperception

Gibson's understanding of affordance was restricted by physical actions which the actor can do with the object when the actor observes that object. Therefore the “perception” that Gibson talked about primarily referred to *visual perception*, and it can also be observed from his work that he also conceptualised misperception in the same manner.

For example, when a person walks into a glass wall thinking that it is air, he does so because both the air and the glass wall have the same optical property of being transparent. As a result, the person misperceives one substance for the other. However, because the glass wall is not air, it does not afford the person to walk through it, thus that person accidently collides with the glass wall.

Gibson concluded that because affordance is a perception, it can therefore be misperceived. Gibson then theorised that according to the theory of visual perception, misperception can occur when the information provided to the actor is inadequate, or the information processing process within the actor is deficient.

Affordance as a perception was discussed, as suggested by Gibson; however, this study considered that this perspective alone, due to its subjective nature, was insufficient to thoroughly unpack the use of technology in the classroom. Although it is valid and accurate to say that how a tool becomes useful to a person depends entirely on that person's perception of the tool, without a point of reference, the perception of the tool, and thus the use of the tool itself, would be irrelevant to the design of a unit or even a single lesson. Academics simply cannot plan how the technology can be used, since any student can use the tool as he or she alone perceives it.

In this study, therefore, Gibson's interpretation of affordance is further expanded by exploring the second school of thought proposed by Norman. This makes it possible to unpack a larger and more practical notion of affordance, while still acknowledging the fundamental root of affordance in the individual's perspective.

2.5.2 Affordance as discovery

In his book *The Psychology Of Everyday Things* (1988), Norman built a case from his observation of various physical objects and adopted the concept of affordance as one of three dimensions in design. Norman had adopted the concept of affordance from Gibson, but he disagreed with Gibson's original view of affordance in several fundamental aspects.

Gibson recognised the characteristics of humans who can alter the affordance of a substance, but his interest was to look at how the *user* of a substance perceived a substance. Norman, on the other hand, had deep interest in looking at a substance from the *designer*'s point of view. He attempted to describe the psychology behind what he considered good and bad design, so that the designer of a substance could adopt good design and avoid bad design and thus increase the usability of the designed item (McGrenere and Ho, 2000).

Through case studies and observations, Norman proposed several principles for a good design. He argued that when first encountering a new item, there are three dimensions that influence us in coming to an understanding about how to operate that item. Those dimensions are: conceptual models, constraints and affordances (Norman, 1988).

- *Conceptual model* is a product of our conscious explanation of how that particular object should work. This definition of "object" can be extended to conceptual objects such as an event or other people's behaviours.

- *Constraint* usually restricts the affordances. These constraints can be the physical constraints of a physical object, which make it impossible for a particular action to be applied to the object (e.g., cannot click outside a computer screen); logical constraints of either physical or non-physical objects, which limit our action according to our own logical understanding (e.g., automatically will not click on text that is not hyperlinked - as indicated by the colour of the text - but user will try to find blue underlined text before clicking it), or cultural constraints, which can be conventions or practices by a group of people that confine the object to a certain pattern of use (e.g. using the scroll-bar that is located on the right to scroll up and down a web page. The designer of the application would not deliberately place it on the left even though it is possible to do so).

- The last is the *affordance* itself, which is the real usage of an object as reflected by the user's actions.

Norman placed importance on conceptual models as the point of reference for good design. However, the concept of affordance was taken up far more strongly by the HCI field than the other concepts and Norman repeatedly expressed his frustration that the word itself was mentioned too many times in the field of HCI, with too little understanding of what it actually meant (Norman, 1999). He later argued that he probably should have used the word "perceived affordance" instead of "affordance" because, "*The designer cares more about what actions the user perceives to be possible* *than what is true.*" (Norman, 1999). With that, he made a distinction between what he later called "real affordance" (true) and "perceived affordance".

Real vs. perceived affordance

Norman suggested that real affordance is what humans can physically do to the substance, which is similar to what Gibson defined as "affordance". However, Norman's description of "perceived affordance" implied that the "perceived affordance" may or may not be the same as the "real affordance", and "perceived affordance" is what the user conceptually forms in his/her mind, rather than what the person can actually do to the substance.

Norman's view of affordance started to diverge from Gibson's original conceptualisation when he began to explain affordance in computers. In the screen-based world, Norman considered real affordance to be about how the user physically interact with the environment, rather than anything else. He said;

> *"In graphical, screen-based interfaces, the designer primarily can control only perceived affordances. The computer system already comes with built-in physical affordances. The computer, with its keyboard, display screen, pointing device, and selection buttons (e.g., mouse buttons) affords pointing, touching, looking, and clicking on every pixel of the screen. Most of this affordance is of little interest for the purpose of the application under design."*

His notion of "perceived" was what could be conceptualised in a person's mind; whereas "real" was what could be physically touched. This differed from Gibson's view, which did not make the distinction between physical and mental perception.

Therefore, in Norman's view, when a designer add 'things to do' to the screen of a computer, that additional function cannot be considered an "affordance" ("real affordance"). They are simply "visual feedback" that advertise or promote the affordance. For example, when the user see a button on the computer screen they tend to click on that button, when actually they can click just about anywhere on the screen; this is independent of the fact that even if they do click outside the designated area then nothing would happen, since it is how the program was coded. The purpose of the "visual feedback" is to make the user aware of the existence of (real) affordance. He added that "visual feedback" is the "perceived affordance", and explicitly said in his conclusion that "*the affordances, the feedback, and the perceived affordances can all be manipulated independently of one another.*"

Norman pointed out the many misunderstandings about this concept in the HCI community (e.g., a graphical object on the computer screen does not afford clicking, because user can click anywhere even outside that object). The use of an object in the shape of a button to indicate a spot on the screen to click and invoke a function is simply a convention. Instead, Norman put greater emphasis on the *constraints*, and many of his views of affordance, either real or perceived, can be better understood when we understand his conception of "constraints". He also said that the "physical constraints" are most closely related to the "affordance" (real affordance).

Later on, Norman said that the term "affordance", which created in the HCI field, should be dropped altogether, and he introduced new terminologies to clarify his ideas. Such detailed debate might be relevant for the field of HCI, but it has limited benefit for educators. The significance of Norman's contribution is the notion of an affordance as a property that the designer embeds into the product he/she has designed (that is, "real affordance"), and the learning process by the user to recognise (or to perceive) that real affordance and utilise it.

Within Norman's view, therefore, the affordance per se already exists, embedded within the object, and remains there dormant as an objective reference which can be used later to judge individual perceptions of that object. However, since that real affordance will not be used until someone actually perceives it and acts upon it, Norman acknowledged the existence of affordance as perception, independent of the affordance as an objective reference. The consequence of this is that the user can misperceive, which occurs when his or her perception of the affordance is different from the actual affordance embedded within.

In the context of Web 2.0, many times the genesis of a product did not derive from the fully understood needs of a defined group of users. Using a wiki as an example, one of the unique affordances of a wiki embedded by its creator as a feature of the tool is to allow multiple contributors to put their content (text and media) onto a page and edit it, sometimes at the same time. However, users would often see a wiki simply as a place to attach a file for others to download, a function that is normally the unique affordance of a cloud-based storage system such as DropBox, Box, and SkyDrive. Such perception cannot be judged as wrong, as there is no right or wrong in a practical sense; rather it can be said that it is different from the intention of the designer of that tool and that the "different use" of the wiki can be what was needed by that user at that time.

Discovery in social context

The earlier discussion highlighted the significance of learning as a socially-situated activity. As the technology which mediates the learning activity was investigated, there is also a need to see the usage of that tool within the social context. This study expands on Norman's work following his own development towards social context.

In his recent work Norman, 2008), Norman introduced a new concept of signifier, behaviour and trail. A *signifier* is a state, either physical or social, used to make a judgement about a situation. In short, it is like a clue. Norman suggested that designers should focus on the signifier instead of the affordance, especially when the product is not used in isolation but as an individual becomes a member of a community of users or a social structure. *Behaviour* refers to the actions of a single user, and a *trail* is a record of a behaviour acted in the past when it is no longer possible to observe the user directly at present. Norman argued that these concepts are significant, as most of our actions are socially situated, meaning they involve others. Therefore, the behaviour of a group of people can become a *social signifier* and therefore an indicator of the state of circumstances that can be interpreted meaningfully.

Norman's explanation of "signifier" resembles his definitions of "cultural constraints" and "convention" in his earlier work. However, a signifier is not a matter of agreement or habit, but what come to be realised when we see others' behaviour. Of course, when we attempt to interpret situations by observing how others behave, there is the issue of how reliable our observation is, which Norman noted. There is also the possibility that behaviours are done deliberately for us to observe, or not. Norman also noted this complexity but argued that they were nonetheless still signifiers. In his attempt to mitigate the confusion created by the word "affordance" in the field of HCI, he said, "*Social signifiers replace affordances because they have broader and richer meaning, allowing for accidental signifiers as well as deliberate ones and even for items that signify through their absence.*" Then he added, "*The perceivable part of an affordance is a signifier.*" (Norman, 2008, p.19).

2.5.3 Affordance in the digital world

William Gaver (1991) attempted to expand the Gibsonian view of affordance to make it more relevant to the ICT context. He mentioned two important properties of affordance that Gibson also mentioned, which are: binary and nested (McGrenere and Ho, 2000). To call an affordance "binary" is to suggest that it either exists or it does not exist, therefore there is no "grey area" in between. To call an affordance "nested" is to suggest it can be composed of one or more affordances, just as the possibility of action can be nested in one or more possibilities of action.

Gaver stated there are four possibilities that can occur when perceiving an affordance, as seen in Figure 14. His classification is based on the distinction between the affordances and the available information about them from their actual perception, which in a way is similar to Norman's distinction between *real affordance* and feedback.

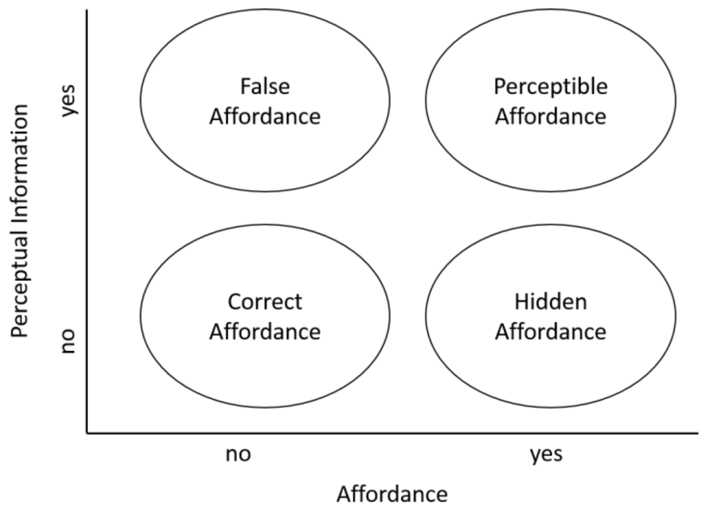

Figure 14 Classification of affordance (Gaver, 1991, p.80)

- *Perceptible affordance* is affordance that does exist and can be perceived by the user, or the affordance that the user is aware of and uses. This explanation affirms Gibson's view of "affordance" and what Norman considered as a match between the "real affordance" and the "perceived affordance".

- *Hidden affordance* is when the affordance exists but the user cannot perceive it. In other words, the perceptual information is not perceived by the user due either to insufficient information or a deficiency on the part of the user to process the information. This affordance, therefore, remains unaffordable. This extension differs from Gibson's original conceptualisation because, as far as he was concerned, if the actor does not perceive any affordance then there is no affordance.

- *Correct rejection* occurs when there is no real affordance and the user also does not perceive any affordance. Thus, the user will "correctly" reject the existence of that affordance. Neither Gibson nor Norman included such definition in their vocabularies, but Gaver identified this state of nothingness, an absence of any affordance.

- *False affordance* is when the user perceives an affordance, when, in fact, there is no such affordance. According to the Gibsonian view of affordance, such a contradiction would not be possible; if perception is absent, then there is no affordance and the actor cannot perform any action on the substance. But, Gibson goes on to argue if the actor does perform an action on the substance, then he/she has perceived it and another person cannot judge it as "false". In Norman's view, this state is possible, when "perceived affordance" differs from the "real affordance". However, Gaver's use of the word "false" suggests that the perception of the user is incorrect, because it does not match the intention of the designer of the item.

The detailed debate on the proper definition of affordance in its various fields of application is beyond the scope of this study. However, when considering the use of a tool to support online learning and viewing the tool from a socio-constructivist perspective in a formal education setting, we need to understand affordances at the level that is meaningful to learning activity.

2.5.4 Affordance in learning

Point of reference

Every user will construct his or her own perception of affordance and this may vary in a non-discrete manner from the perceptions of others. Thus, an affordance itself is "emerging" because, as individual users utilise the tool (Bower, 2008; Brentsen and Trettvik, 2002), they individually perceive the affordance of the tool and initiate an action to use it according to their individual perception.

Within a formal education context, when a teacher designs a learning task and prescribes the use of a particular tool, he/she inevitably forms a perception about how the tool is to be used; or at least about what form of support the students need to complete their task. Gaver's conception of affordance is significant to this study because it makes clear the relationship between the designer's intended affordance as the "point of reference" to observe the other's perception of affordance. Therefore, the weighting given to "misperception" or "falseness" of affordance raises questions about what information is available in the environment that people can use in their learning activities (Greeno, 1994).

Affordance of Web 2.0

Within the socio-constructivist view of learning activity, as discussed before, and taking the model from Engeström's activity theory, affordance of tools would most commonly be associated with a production subsystem where the subject interacts directly with the tools to manipulate or produce an object. However, Web 2.0 is embodied within the learning activity and is pervasive in many facets of the collaborative interaction (see Figure 15).

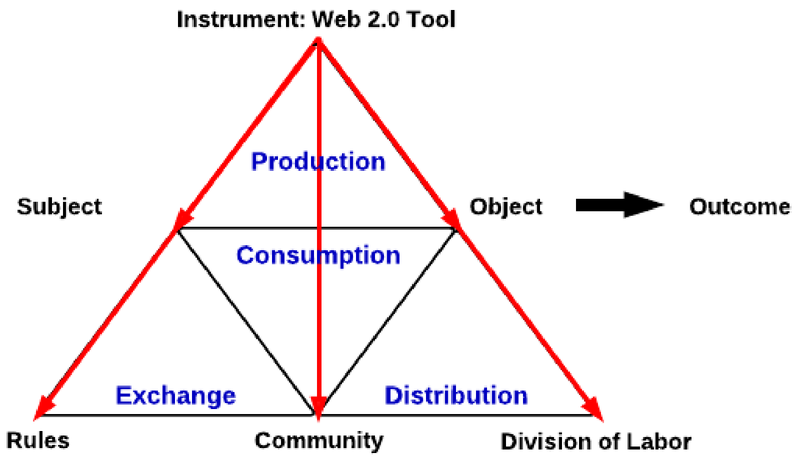

Figure 15 Web 2.0 tools pervade learning activity

An example is a wiki, where the subject can author content and at the same time read and critically reflect on others' contributions in the same wiki. Others, when adding richness and perspectives, may then modify his/her work. Later, he/she might add more of his/her own contribution to the same piece of work. Hence, the producer is the consumer and the consumer is the producer, thus blurring the lines of separation between the production and consumption subsystems. The same tool plays different roles in mediating communication; it also enables various social structures by allocating rights and access privileges to different subjects, thus creating a division of labour.

The tool is therefore no longer just a production tool, but a tool (or a set of tools) that underpins the whole activity. The tools support how we come to know about the world. It is our window to access the various functions of our learning activity. It enables us to access the production functions through authoring capabilities, and provides us with the means to consume information, exchange communication and distribute work. It affords us all that.

While some tools can afford more functions, others afford less; similarly, while some afford a deeper relationship between the components of a subsystem, others afford only superficial relationships. Some other activities may even be impossible to perform without the specific tool; but together, they can promote learning activity more effectively.

2.6 The framework for analysis

Activity theory can be used as a socio-cultural and socio-historical lens to analyse learning as a collaborative activity (Albrechtsen, Andersen, Bødker, & Pejtersen, 2001; Jonassen and Rohrer-Murphy, 1999). It allows us to analyse learning by looking at it as a whole activity.

2.6.1 Establishing the framework

Activity theory purports that all activity is naturally nested (Gaver, 1991; Gibson, 1977; Jonassen and Rohrer-Murphy, 1999; McGrenere and Ho, 2000). This means that each component of an activity system may be the result of another activity. For example, a group that is collaborating is formed by an activity whereby the teacher considers and assigns students into groups. However, the rules by which the collaboration is governed may be the result of negotiation between members of the group prior to the collaboration (see Figure 16). It is important, therefore, for the educator to establish the right framework through which to look at the activity in order to ensure that the use of the framework is practical and directly meaningful.

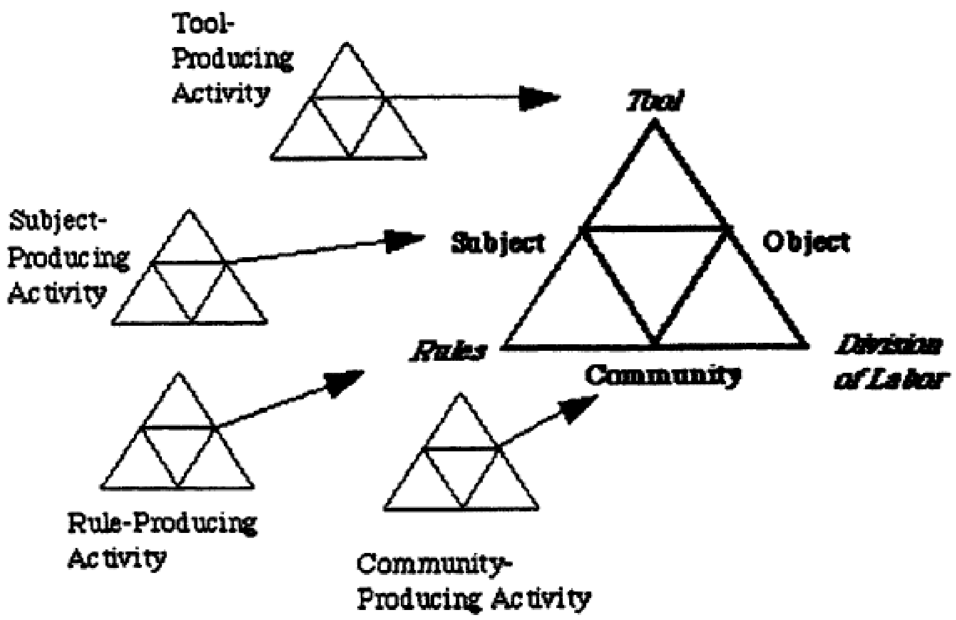

Figure 16 Nested nature of activity theory dynamics (Jonassen and Rohrer-Murphy, 1999, p.67)

Jonassen and Rohrer-Murphy (1999) suggested that, as a framework, activity theory allows educators to focus more on the activities the students are engaged in and the nature of the tools that mediate their activities, rather than just on the state of knowledge, which is what many traditional measures do. Engeström did not offer activity theory for use as a ready-made technique and procedure for research; rather, he summarised several characteristics of the framework that were suitable for use according to the historical practices in the field, and pointed out that the study of activity must be situated within a real-life practice and an action research approach should be used (Kuutti, 1991). Such research thus needs to allow enough time for the researcher to observe the activity, pay as much attention to the broader picture as to the specifics, and take advantage of various data sources (e.g. interviews and observations).

In this study, activity theory was used to guide the research itself and to provide the lens through which this study would look at the wiki-mediated collaborative learning as a holistic activity.

2.6.2 The activity system

As explained before, the unique characteristics of Web 2.0 tools have redefined the relationships between the components in Engeström's activity theory; thus the framework must be placed within the proper frame. The adaptation of this framework for this study is shown in Figure 17.

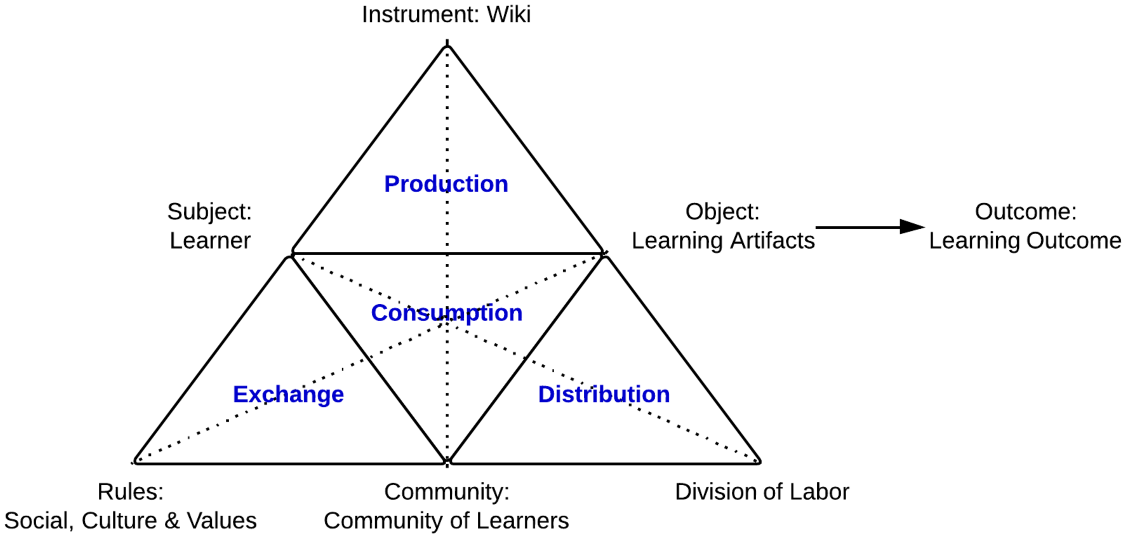

Figure 17 Activity system as framework for analysis

The activity system observed is placed at the level that corresponds to the learning objective of the activity, that is, the ill-structured problem to be solved. When the problem space is properly understood, it defines the rules, community and division of labour components within the activity system. When the object to be produced and the tools that mediate the activity are identified, the activity system can be used properly as an analysis framework.

The following sections unpack the framework presented in Figure 17.

Learner

The learner is the subject of the activity. From a Gibsonian perspective, the affordance to be observed is the relationship between the action the learner takes and the perception he/she acquires at the time the action is undertaken. From an activity theory perspective, the tool is an inseparable component that binds the action taken by the subject with his/her perception about the activity (Albrechtsen, Andersen, Bødker, & Pejtersen, 2001).

Therefore, the learner is not only the agent of the activity but also the point of reference to record the perspective about the activity and the tools. Qualitative techniques are needed to record experiences and actions when engaging other within the community and when learners engage themselves through the use of Web 2.0 tools (Jonassen and Rohrer-Murphy, 1999).

Depending on the class size and the design of the interaction, a learner can be a group of students working consistently on a single unit of work throughout the semester. The selection of the learner will depend on the activity to be framed. When the analysis is to look at the interaction within a group of learners, then the subject of that analysis is one individual learner in that group, and the group itself is the learning community. However, if the purpose is to see inter-group dynamics within a cohort of students, then the subject could be one of the groups consisting of multiple students, and the class is the learning community.

Learning artefact

The object of the activity is the learning artefact, an observable product resulting from the activity that can be acted upon. The artefact is not only produced by the production function, it is the product of the whole activity system, thus it represents the intention or purpose of the activity. The transformation of the object moves the subject closer towards the achievement of the goal, satisfying that purpose (Jonassen, 2002; Dillenbourg, 1999; Jonassen and Rohrer-Murphy, 1999; Victor Kaptelinin, 2005).

Web 2.0 tools

As mentioned earlier, the Web 2.0 tool is pervasive and mediates the entire activity; thus it provides affordances to various aspects of the activity. These affordances can only be meaningfully observed when focusing on the *tool - individual learner interaction* and the *tool - community interaction*.

Depending on the artefact involved in the activity, there could be more than one tool, and these can be either cognitive or mediating tools (Jonassen and Rohrer-Murphy, 1999). Cognitive tools are used to support a constructivist approach to learning through problem solving; mediating tools are used to mediate conversation and collaboration between the learner and the community. In a complex authentic problem-solving situation, the learner may have to deploy more than one tool to provide enough support for all aspects of the activity.

Community of learners

Practically there is no human activity that can be done meaningfully without the presence of a community with which whom that individual interacts (Jonassen, 2002). In learning, the community consists of those who are directly involved (rather than through proxies) and interact with the learner. Therefore, the community of learners is the collective of learners who take part in the same activity and who work towards the same goal. The geographical location of the members is somewhat irrelevant compared to the proximity of engagement that determines the membership of an individual in the community. The characteristic of the activity itself must require and promote collaboration among community members in order to achieve their intended outcome and thus allow observable interactions between subject-community, tool-community and object-community.

Rules: Social culture and rules/values

Jonassen (2002) defined rules/values as the explicit regulations, laws, policies and conventions that constrain activity and that also encompass the implicit social norms, standards and relationships among members. The context of the problem will largely determine the rules/values in Engeström's activity theory (Jonassen and Rohrer-Murphy, 1999) in the same manner as the conventions and constraints described in Norman's affordance, but at the activity level. It is the result of a dialogue between the subject and the community that, in the case of formal education, may include the teacher.

Division of labour

Division of labour is realised through the division of power and status (Engeström, 1999a), as well as through the horizontal division of responsibilities. These divisions can be either negotiated by the community when they engage in the activity or mandated upon the community (Jonassen, 2002). (Dillenbourg, 1999) argued that the existence of division of labour is paramount in establishing a collaborative context. He added that the division can either be *horizontal*, whereby the division of work is based on its levels and where the task can be broken down into more detailed components; or *vertical*, whereby the task is divided into independent sub-tasks in a cooperative manner.

Production subsystem

Many researchers consider production to be the focus of an activity system because production subsystems are the actions that transform an object towards its goal (Jonassen, 2002; Nardi, 1995). Web 2.0 tools are also production tools to convey a learner's thoughts and contributions and are aimed either towards learners or to others in the community.

In a complex ill-structured problem space, it is possible that the learner will use not just one but an array of production tools with unique or overlapping affordances. Web 2.0 has a unique property that is not accounted for within the traditional Engeström view of activity; namely, that to some extent, multiple learners can use the tools concurrently, which results in greater dynamics within the activity system.

Consumption subsystem

Consumption is one of the three subsystems that highlight the crucial relationship between the learner, the learning community and the artefacts. It covers both: (1) learner's actions when consuming artefacts produced by the community and (2) the community's action when consuming artefacts produced by the learner. Through this mutual consumption, the learner and the community can have a meaningful learning interaction and the tool becomes a knowledge-building device that helps the learners and the community to construct socially-shared knowledge collaboratively (Jonassen and Rohrer-Murphy, 1999).

Exchange subsystem

The exchange subsystem is not simply a peripheral subsystem to support production; it plays a crucial role in allowing the group to collaborate as a group. Tolmie and Boyle (2000) noted that one of the factors contributing to the success of computer-mediated communication is how much the learner knows about the other learners, or the community of learners. They observed that the more familiar members of a community were with one another, the more willing they were to use the technology to support their tasks. This warranted the need for a face-to-face meeting prior to the online-tool-mediated collaboration or other efforts to improve the familiarity of the group members with each other (Levinson, 1989; Lewis, 1997; Tolmie and Boyle, 2000). Within the exchange subsystem we also recognise the various individual, as well as collective, norms, rules and values that influence the manner of interaction between the learner and the community (Engeström, 1987; Jonassen, 2002).

Distribution subsystem

The division-of-labour component, as previously explained, is the embodiment of the distribution of workload and responsibility (Dillenbourg, 1999). Thus, the distribution subsystem is a necessary subsystem for a fair and functioning collaboration. On the surface, this subsystem resembles the traditional cooperative learning that consists of task structure, reward structure and authority structure (Slavin, 1980). However, within the context of constructivist collaboration, the distribution subsystem is a negotiation and re-negotiation of statuses that underpins collaboration. It enables more complex problem solving, which affords the community of learners the opportunity to negotiate ideas and tryout a construct within the shared artefact (Hmelo-Silver, 2004).

2.7 Positioning the study

As Dillenbourg (1999) implies, it is not the being together that facilitates collaborative learning, but rather the learning activities themselves; hence an emphasis on designing good learning activity that will allow individual learners to have *learning-enabling discourses*. This is the underpinning principal of the socially-constructed knowledge creation process in social constructivist theory, which is where this study is situated.

Therefore, the learning discourse that drives the activities needs to be a meaningful and situated to allow building of connections between the *knowledge–to-be-created* with the real-world concepts. Problem solving, and in particular *authentic problem solving*, provides the venue for this meaningful discourse to sprout and flourish. Wiki, as one of a myriad of Web 2.0 technologies available, has the affordances to facilitate those collaborative processes.

For this study, a conceptual framing is required to analyse the dynamic interaction taking place during that discourse. Activity theory, which has been unpacked in this chapter, is a suitable framing to visibly and explicitly describe the components of the activity. The activity system is selected to be used as the framework for anlaysis because it can provide consistency in both looking at the activity and the affordances enabling that activity.

As the shift in learning is brought about by a socially constructivist approach which drive the change from a transmissive learning model to a self-regulated learning model where the more dominant role of the learning community is acknowledged. By looking closely at each sub-system following the analysis framework, this study will be able to examine the enabling technology affordances which underpin the learning activities.

This study therefore looked at three main questions: the perceived affordances of wiki to tertiary students who were undertaking their collaborative problem solving tasks in an Australian university; the discourses as they negotiated those affordances and turned them into utilisation, and the role of the academics and students in this ecosystem. Suitable case studies, that is, case studies that had authentic and meaningful collaborative problem solving tasks and an environment conducive to perceiving and using wiki affordances, needed to be selected. Ultimately, this study aimed to offer a framework for an ecosystem that would help educators when introducing wiki into their collaborative learning activity.

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3 Methodology

3.1 Approaches

This study sought to investigate how tertiary students collaborate using collaborative Web 2.0 tools in their learning, and it did so by looking at the use of one particular tool, the wiki. More specifically, this study looked at: (a) what affordances the wiki offered students undertaking collaborative learning tasks, (b) what learning discourses these affordances supported, (c) how students perceived those affordances and used them in their collaborative learning activity and (d) what influence academics had in this process. This study attempted to understand these questions by looking at the learning activity around the wiki as an ecosystem, appreciating and exploring the complexity of a technology-mediated activity in a socially-constructed meaning-making process.

To achieve that, this study adopted the use of collective instrumental case studies, framed by the investigative lens of cultural-historical activity theory (Engestrom, 2000).

3.1.1 Case Study

A collective case study approach was selected as the best instrument to allow rich investigation of a complex situation (Lancy, 1993) and a collaborative learning activity was selected as an ecosystem of a complex situation. This approach afforded the researcher an in-depth look at the context and activities involved so as to construct a theoretical framework that could then be applied to a broader context (Stake, 1994, 2005).

The purpose of selecting multiple cases in this study was not to infer anything about the particular cases themselves; rather each case study was used as an instrument that provided different viewpoints from which to gain better understanding and clarity about the theory-building process (Flick, 1992; Mills, Eurepos, and Wiebe, 2010; Stake, 1994). The three case studies in this research were therefore about three different subjects and were undertaken with three different cohorts of students. They all, however, posed the same questions and employed the same approach and instruments. Each case study gave different perspectives and enabled this study to draw common themes.

3.1.2 Theoretical Framework

Cultural-historical activity theory (CHAT) (Engestrom, 2000) was used to provide a framework to guide this study as well as to interrogate the learning activity as a complex social constructivist collaborative environment. To guide the study, activity theory was used as a descriptive research tool to identify and highlight the situational factors (Yamagata-Lynch and Haudenschild, 2009) that influenced the adoption of the wiki as a tool to mediate collaboration. As an investigative lens, it was used to look into the dialectical relationship focusing to analyse the gap and interplay between the actual actions taken by learners and the plans, intentions and actions of instructors (Engeström and Sannino, 2012).

This study also noted, however, that there is a limit as to how representative the selected cases could be of the general practice faced by educators on a daily basis; therefore, it was not the intention of this study to generalise beyond reasonable limits. This study could be repeated in the future, however, to expand the boundaries of generalisation further (Stake, 1994) and explore other Web 2.0 tools or other approaches to collaborative learning.

3.2 Case Study Criteria

3.2.1 Situated

To make a meaningful and rich discovery of patterns and themes, the case studies were selected from units that require students to undertake collaborative learning tasks in the form of a situated project. A project-based task was preferred because typically students would be working in a small group and would stay within their group for most of the project. With such tasks, the research could observe the extent to which each student took an active and meaningful role within his or her group work, enabled crucial rapport to build over time and allowed tighter collaboration between group members (Boud and Feletti, 1997; Hmelo-Silver, 2004; Jonassen, 2007).

3.2.2 Integrated

The study looked for units that already had a project-based task built into their curriculum; such a unit would be better prepared to utilise a wiki fully to facilitate discourse and any collaborative learning activity designed around it. The academics would also be more prepared to utilise and support their students in using the wiki.

3.2.3 Collaborative medium

Lastly, the researcher looked for units that were already utilising the wiki as a medium for collaboration. There are varying perceptions and expectations that academics have about a wiki (Bower, Hedberg, & Kuswara, 2009) and, as with any other Web 2.0 tool, there are no right or wrong ways to use the tool. Generally, a decision to use a wiki was not due to its collaborative abilities, e.g., a wiki was perceived simply as a place to store online links instead of as a medium for collaboration and discourse to critique online published works; or it was considered as an e-portfolio, which made it indistinguishable from a standard web page. These differences could be subtle, but the groups' approach in using wiki would inherently be very different.

3.3 Case Study Design

With these criteria in mind, a process was initiated to find and select suitable case studies. Once they were selected, observation and data collection processes were undertaken through a student questionnaire, individual or group interview, reflection reports and individual interviews with academics. All these are shown in Figure 18.

3.3.1 Case Selection

Verbal invitations were sent to multiple academics in several faculties at a large Sydney-based university. The positive responses to the invitation were subjected to a preliminary *unit outline analysis* so that the researcher could examine from their written text how the wiki would be used, whether as a collaborative medium in a project-based task or not, and what activities students were expected to carry out with it. A situation where academics had clear expectations but gave enough flexibility for students to explore was the most desirable criterion for this study.

Following this, *preliminary interviews of academics* were conducted one-on-one with the unit convenors to fully understand what the project-based tasks would be, how the academic intended to use the technology as collaborative medium, whether such technology had been used before in previous semesters and how the tools were used.

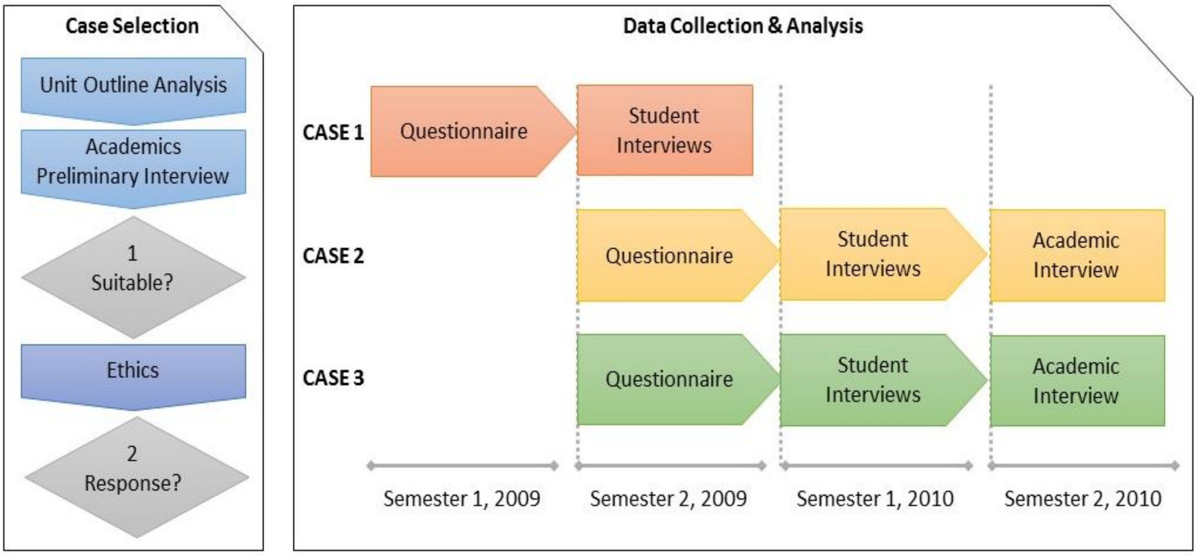


Figure 18 Research design

At the time that this study was started, there were few academics using web technology to support collaboration in their units. Among those who were, many used such technology to showcase the work of individual students or as a means of self-reflection, but with only limited interaction, such as students commenting on each other's work. Many such instances were done with minimal or no encouragement for ongoing interaction; this was due to various constraints, such as time and the low attention given by the academics for the use fo the wiki in the unit. Others used technology to showcase students' work to a wider, often general, audience, but had no strategy to invite substantial discourse with the public. This frequently resulted in no response from the public at all and the unit had to be satisfied with just the students having the courage to showcase their work publicly. Some units intended students to share an online tool; however, students were required neither to negotiate collaborative meaning-making process nor to have any discourse; they were satisfied with just having a place to share.

In a number of potential cases considered by the researcher for this study, the unit convenors were willing to work with the researcher to re-design their unit outline and create project-based tasks that were more collaborative, thus making their unit more appropriate for the study. However, doing so in a short time could have resulted in collaborative tasks that were not well-integrated, were peripheral and would not contribute significantly to the students' learning of the subject, which in turn would have undermined this study.

An attempt was also made to acquire cases from graduate-level subjects, to provide the perspective of mature students. At the graduate level of the university, there were two modes of study based on a percentage of online components. Two units were identified and this study attempted to acquire both as graduate-level cases: one from a standard graduate unit, the other from a totally distance-education graduate unit, both in the education department. However, one of the graduate courses was cancelled by the university and was no longer on offer within the time period required by this study.

The first selection process was completed (as seen on the left column of Figure 18) according to these criteria and constraints and four cases were selected for the research to be undertaken between Semester 1 2009 and Semester 1 2010. Case1 was a computing unit and Case 2, 3 and 4 were education units. Ethics approval was sought and obtained, as follows: Case 1: Computing Unit, HE27FEB2009-D06280, Case 2: Education Unit, HE27FEB2009-D06279, Case 3: Education Unit, HE29MAY2009-D06616HS, and Case 4: Education Unit, HE26JUN2009-D06642HS.

When the first semester started, respondents were recruited from the four selected units to seek students' voluntary participation in the study. Time was allocated in each of the units' first session to brief and introduce the study to the students. Information flyers were handed out along with consent forms to be returned within a week.

After the consent forms were collected, the second selection process (Figure 18) was carried out to check if each case had a sufficient number of respondents to continue. One of the four cases, that from the graduate-level study, had to be dropped due to lack of participation. The study then continued to the data collection and observation stages with the remaining three cases.

3.3.2 Participants

Each case study was slightly different from the others. Detailed descriptions of each are given in separate chapters (Chapters 4, 5 and 6) within this report; however, a brief overview is provided here.

- Case Study 1 was the pilot case study, which was situated in the Computing Department and conducted over two semesters in 2009. The case study comprised of students from three final-year units (COMP340 & COMP345 Software Engineering Projects and ISYS346 Information System Project). These units were capstone units that aimed to bring together the knowledge and skills that the students had acquired during their study. The students in this case study were relatively very proficient in the use of technology and comfortable in exploring the use of web-based tools.

  The collaborative task was designed around a work-based project that students had to carry out for industrial clients, where each group assigned to a client had to carry out a full software development life cycle (SDLC). SDLC is a cyclic process of developing a software product consisting seven phases from design to maintenance (Sommerville, 2004). Of the 78 students enrolled in the units, two students, one each from two separate groups, were selected to engage in the structured interview to provide their in-depth stories.

- Case Study 2 was conducted over two semesters in 2009 in the Education Department. This case study consisted of two consecutive final-year units: theTEP414 Professional Experience I (Semester 1) and TEP415 Professional Experience II (Semester 2). The majority of the students who enrolled in TEP414 continued on to enrol in TEP415, and the study followed the students who completed both units. The students in this case study were final year pre-service student teachers who had a range of exposure to and comfort levels with computer technology; some felt threatened using the technology in their study. Of the 24 students enrolled in the units, 54% of them responded to the call to participate in the study and eight of these consented to be interviewed.

- Case Study 3 was also conducted over two semesters in the Education Department. This case study consisted of another two consecutive second-year units: TEP209 Curriculum and Teaching in the Primary School I (Semester 2 2009) and TEP291 Curriculum and Teaching in the Primary School II (Semester 1 2010). The entire cohort of students who enrolled in the first unit continued to enrol in the second unit; students who joined the unit in the second semester but not in the first were excluded from the study. The participants in this case study were also pre-service student teachers, and as the academic who teaches the unit pointed out, they were younger than most pre-service students-teachers. Of the 152 students enrolled, 22% responded to the invitation for the study and nine of these consented to be interviewed.

The majority of students participating in this study were female (71%). Although some research indicated that there could be differences between the genders in the way students perceive, respond to and interact with technology (Jackson, Ervin, Gardner, & Schmitt, 2001; Singh, 2001), gender, ethnic and racial backgrounds were not considered in this study.

3.3.3 Academics

Since at the time of this study there were not many academics using a wiki in the manner sought, there were only two academics out of the six who responded to the initial (verbal) invitation and who were eligible by the end of the second selection process to take part in this study; one academic was involved in the case in the Department of Computing and the other was involved in the two cases in the Department of Education.

In addition to the student respondents, this study also interviewed the academics involved in the cases. In all cases, the academics interviewed were the ones who designed and delivered the units during the period of this study. Interviews with the academics were conducted prior and after semesters to understand their intentions for the tool in their units and their reflections about how their students had used the tools.

During this study, some publications were produced with the relevant academics in regard to the specific case in which they were involved.

3.3.4 Intervention

There were no additional interventions to help or influence either the academics in their selection of the wiki in their unit design or the students in their use of the wiki. The academics took full authorship and control of the tasks and of the selection of tools to be used in their units.

This approach was deliberate and in agreement with the unit convenors. This was because the study intended to observe how students interacted with the Web 2.0 tools in their learning, what affordances they used and why, what the tools enabled them to do and what affordances allowed them to interact with each other and perform the necessary tasks.

Because students' technical competency levels varied greatly, the lecturer allocated one face-to-face session early in the semester to introduce the tools. These workshops were part of the normal class timetable and already included in the unit outline. Basic features of the tool were demonstrated and explained to ensure that all students had the minimum skill sets required to use the tool comfortably. The researcher did not take part in the delivery of these workshops; they were fully designed and delivered by the relevant academics.

3.4 Observation & Data collection

Refering to Figure 18, observations and data collection processes were carried out independently for each case, according to their respective semester timetables. The overview and timing of observations and data collection can also be seen in Figure 18.

This study investigated the affordances that the wiki offered to students undertaking collaborative learning tasks, the learning discourses the affordances supported, and the student's reflections on how they perceived those affordances as supporting their collaborative learning activity. These were primarily investigated from the students' perspective.

The researcher sought to carry out observation and data collection with minimal interference to the students; this was done to ensure the authenticity of the students' perceiving and negotiating of the wiki affordances in their tasks. Therefore, this study utilised *individual or group reflection reports*, which were already part of the unit design and contained items about students' reflections of their collaboration and use of the tools. A *questionnaire* was administered at the beginning of the unit, the *wiki observation* during and *individual students or group interviews* at the end of semester for each case.

The study also aimed to capture insights into the influence that academics had on this process. To achieve this, academic *interviews* were conducted at the end of each case to collect their reflections on the collaboration and technology used by the students in their unit and to reflect on the academic's original expectations, as captured during the first selection process. The academic interviews were conducted after the marks were published to avoid any perception of coercion imposed on the students.

3.4.1 Students Questionnaire

The questionnaire (as shown in Appendix A) was designed to capture students' perceived affordances about the wiki before the observation was conducted; how they might use them in their collaborative learning activity and what kind of learning discourses they perceived the wiki could support. The purpose was to provide a baseline context to inform the analysis and subsequent interview about the students' perceptions and decisions in utilising certain affordances and not others.

The questionnaire was administered three to four weeks following the student's agreement to participate. Each student was sent an individualised link to the online questionnaire which allowed responses to be identified and put in context with the interview and wiki observation data collected later. Participants were given several weeks to complete the questionnaire.

The questionnaire was designed with two parts; the first consisted of 13 Likert-scale questions to probe participants' perceptions about collaboration and technology usage for collaboration. The second part consisted of 11 open-ended questions that provided the opportunity for detailed reflection on group dynamics and expectations regarding technology.

3.4.2 Wiki Observation

The three cases in this research used two different types of wiki. **Trac** and its wiki was used in Case 1, and **PBWiki** was used in Case 2 and Case 3. Within each case study, numerous wiki pages were produced by students for their collaborative tasks; each group, however, was assigned its own discrete space in the wiki.

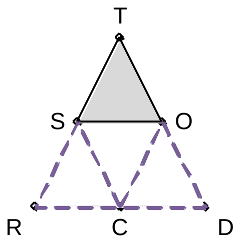
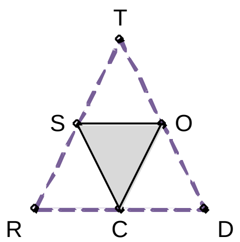
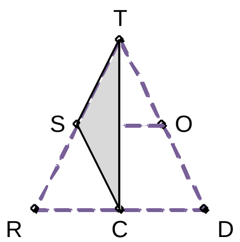
Both direct and indirect observations were carried out:

- Direct observation was done through looking at the changes in the wiki spaces, by gaining access to each wiki space and using a consistent observation framework to analyse how respondents used the given space.
- Indirect observation was done through acquiring students' personal reflections about the wiki and their group's usage of the given space.

Direct observation

The observation framework (Figure 19) used for the direct observation was adapted from cultural-historical activity theory (CHAT) (Engestrom, 2000) and was applied across all groups and case studies. It particularly observed the various sub-systems when looking at an activity, to identify the affordances the wiki offered to students when undertaking a collaborative learning task. Each group used the wiki differently from the others, depending on what affordances they perceived in the wiki that supported their learning discourses and collaboration.

The wiki observation framework is shown in Figure 19:

<table>
<tr><th>Activty System</th><th>Guiding Questions for Observation</th></tr>
<tr><td>1. Production
</td><td>What affordances are utilised by individual learners when producing artefacts?
How are documents being produced?
Are there any unused authoring features?
What are the frequently used features?
What is the frequency of usage? (System log)
How easy is it to use the production capabilities?</td></tr>
<tr><td>2. Consumption

</td><td>What affordances are utilised when interacting with the peers in producing artefacts?
How are documents shared? And consumed by each other?
What features of the tools are used or not used to share work?
Are there any visible collaborative works on a shared object? (e.g. shared editing)
Does the use or utilisation change over time/over the stages of the collaboration?</td></tr>
<tr><td>3. Communication</td><td>What affordances are utilised when individuals interact socially with others?
How does the communication flow within the group?
Has the tool created or influenced the creation of a new communication style?</td></tr>
</table>

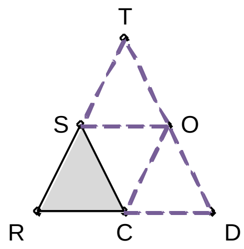
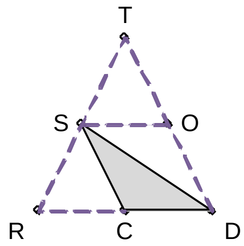
	• Has the tool inhibited the communication?
4. Distribution 	What affordances are utilised when an individual organised the group work with others/self? • How was the work divided? • Is the division of work influenced by the features of the tool? • Is there any visible evidence that the division of work is restricted by the tool? • Does the use or utilisation change over time/over the stages of the collaboration?

Figure 19 Observation Framework

The left column shows the activity system diagram and the shaded area indicates which part of the sub-system is being observed; the letters indicate the components of an activity system, namely: T - Tool, S - Subject, O - Object, R - Rules, C - Community, D - Division of labour.

- Observation 1 looked at the production sub-system, with the aim of identifying how the wiki was being used by students to produce the arious documents or tangible deliverables required when undertaking collaborative learning tasks.

- Observation 2 looked at two things. The first was the consumption sub-system, with the aim of identifying how students and the group they were part of consumed the object produced. The second observed the interplay between the production and consumption sub-systems to identify how individual students and the group produced and consumed the deliverables. This production and consumption would indicate what learning discourses were supported by the wiki.

- Observation 3 looked specifically at the communication sub-system. It aimed to identify how each member communicated with others in his or her group to support collaboration through the wiki. This indicated what kind of affordances the wiki offered and the type of learning discourses supported.
- Observation 4 was observing an interplay between the consumption and distribution of labour sub-systems. This observation looked for proof of coordination efforts by the group as they used the wiki. This would enrich the observation and paint a better picture of the learning discourses supported by the perceived affordances of the wiki.

The observation was undertaken by the researcher taking screen captures and examining the built-in track changes feature of the observed wiki to analyse changes made to the pages guided by the Observation Framework (Figure 19).

Kuswara and Richards (2011) suggested three classifications of use when looking at how a wiki was used through the spectacle of an activity theory (Figure 19): (1) as a mean for communication where the wiki used to pass messages between members, (2) as a mean to facilitate sharing and consumption of files and other artefacts between members, (3) as a mean to coordinate individual and collective efforts dividing tasks and labour. This classification corresponds to the three out of four subsystems in Activity System (Engestrom, 2000), namely: exchange, consumption, and division of labour.

This observation was repeated over time; each time observation was made it was noted against the classifications suggested by Kuswara and Richards (2011) and also who made the edit, for what purpose was the edit made, was the edit directed to be noted by other team member or directed to the person making the edit him/herself.

Indirect observation

As noted previously, the indirect observations were based on students' reflections gathered through reports. The reports themselves was already part of the unit's assessment and intended primarily for the students to reflect about their learning; however, one section of each report was allocated specifically to capture students' reflections about the role of the given wiki space during their collaboration and their perceptions about the tool itself.

These reflection reports could be either individual or group reports, depending on their respective unit guidelines.

3.4.3 Students Interviews

Approximately two to three weeks before each semester ended, those who had consented to participate in the semi-structured group interviews were interviewed. The guideline questions for the interview can be seen in Appendix A: Research Instruments. The interviews were recorded and then transcribed.

The interviews explored respondents' use of the tool and how it supported their production, communication and coordination efforts within the group work; it also asked how, in retrospect, respondents valued the tool for sharing and collaboration. Specific questions were devoted to communication within the team, where the tool played a role and how members interacted when communication was mediated by the tool.

Since the online questionnaire system tracked individual responses, it was possible to place individuals' interview responses within the context of the questionnaire. This provided further insight into their perceived affordance of the tool and into their group dynamics in the tool-mediated collaboration. Some participants decided not to do the interview, even though they had contributed to the questionnaire.

3.4.4 Academics' Interviews

The academics involved were both unit conveners; that is, they designed and delivered their unit during the study; they too were interviewed through semi-structured individual interviews at the beginning or end of the study. The interview asked about their expectations, the features of the tool that appealed to them and what other tools were considered in their design; it also explored how they envisioned students' interaction with the tool before the start of the teaching unit, and afterwards asked retrospectively what kind of role the tool had played.

The next three chapters, 4, 5 and 6, will look at each case study individually. Each chapter starts with an explanation of the specific individual context and details relevant issues pertaining to that case.

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4 Case Study 1: Pilot Case

4.1 Introduction

The first case study was a pilot case study in a course for the Computing Department. This case study covered three units: ISYS346 *Information Systems Project*, COMP340 *Systems Engineering Project* and COMP345 *Software Engineering Project*. All units were final-year capstone units offered at undergraduate level for *Bachelor of Information Technology, Bachelor of Computer Science* and *Bachelor of Information Systems* programs in the university. These capstone units aimed to tie together students' previous learning and prepare them to enter the workforce.

In each unit, the collaboration task was to carry out a complete software development lifecycle (SDLC) project as a team. Students were placed in a team of five and each team member was assigned a different role. As a team, they had to work on one project with a hypothetical or an authentic industrial client. No two teams in the class had an identical project, each project was unique. The client was the main stakeholder for each project and provided each team with the project requirements. The client was also the person who evaluated the project's deliverables at the end of the project cycle.

To accommodate the lengthy process of authentic SDLC, the units were taught over two semesters in 2009. The teams were formed at the beginning of the first semester, at the end of which, team members were reshuffled to give each student the opportunity to take on different roles and responsibilities within the SDLC project. There were several roles that students could take: project manager, quality manager, database designer, programmer, program tester and other roles determined by the team to satisfy the needs of the project.

The collaboration tasks were highly structured with a well-defined set of collaborative activities (that had been introduced in units in prior semesters), such as software engineering, systems analysis and design and project management units. The collaboration activity was basically the multi-stage life cycle of a software project, starting with a *user requirement analysis,* followed by iterative processes of *designing*, *building* and *testing a prototype*, and then concluding with *pilot implementation*. As they moved from each stage to the next, the students had to collaborate with the other team members because there was no single task that could be performed entirely by a single individual.

4.2 Web 2.0 tools

Throughout this particular case, the main tool that the students were required to use was Trac (http://trac.edgewall.org/). Trac is a collection of web-based tools consisting of a *wiki*, a *job-ticketing* or *task-monitoring* tool, and a *document/file version control tool* or a *subversion* tool called *TortoiseSVN*. All these tools were designed specifically to support software development life cycle (SDLC) projects. Each tool can link back to other tools to provide an appropriate context for every piece of information throughout the development life cycle.

While the students in this particular case were required to use Trac, they were free to explore the tools and decide how to use them as they saw fit to accommodate their team's collaboration needs. Students were also allowed to adopt any other tools of their own choosing to complement Trac if they desired to do so. Some of the stakeholders also specifically requested or mandated the use of certain communication systems to facilitate the relationship between the student project team and the stakeholder's internal project team.

The wiki of Trac tools was designed for a general purpose usage, therefore unlike other tool within Trac tools, the wiki is the most flexible and customisable tool. This allowed participants to adapt their wiki tool to match their collaboration needs.

4.3 Learning tasks

The task was to carry out the software development life cycle (SDLC) as a team to design, build and implement an actual software product requested by the stakeholder. The unit outline for the subject stated:

The objective of this unit is to convey to you, as a third-year undergraduate student, an appreciation, understanding and experience of the software engineering process and the many activities which must come together in a successful systems development project. You will be assigned to a 4 to 6 person project team to provide a computer-based solution to a real-world problem. There is a strong focus on the application of sound project management principles, teamwork and dealing with customer requirements, as well as coming to grips with the underlying technical issues to the extent necessary to produce a successful project outcome
(Richards, 2009, Retrieved from http://www.comp.mq.edu.au/units/comp345/outline.html).

The teams were formed by the lecturer, who then assigned the projects to them. Some projects (COMP340) were authentic industrial projects which have several real external clients from companies. Teams engaged in an authentic industrial project could also be subjected to additional requirements from the company's internal project team. Other teams were assigned a hypothetical project which the lecturer made up, based on previous experience or current industry trends. For these teams, the lecturer acted as the project client.

Software development life cycle

During the first semester, the students followed the *Waterfall* software development life cycle (SDLC) (Sommerville, 2004), which consisted of seven phases, namely: *requirements definition*, *design*, *implementation*, *unit testing*, *integration & system testing*, *operation* and *maintenance*. The last two phases were not included in this task because they were outside the scope of the software development project. During the second semester, the students adopted an *Agile Programming* approach, where they recursively repeated a three-week cycle of prototyping and reviewing with the client.

For every project, the students were required to identify what software product was required, in what manner the product was expected to perform and be delivered, and any other requirements specified by the client according to its business needs.

Changing requirements

As part of the SDLC, each team needed to scope and confirm the requirements. This was done through a series of meetings with the stakeholders. In this step, the main concern was to get the requirements documentation validated and to begin construction. The requirements documentation followed the IEEE standard and consisted of multiple sections such as product scope, user characteristics, functional requirements, non-functional requirements and design constraints. In a typical software development life cycle, the developers engage regularly with the client, negotiating changes and attempting to respond to the client's justified demands as much as possible without placing the project too much at risk.

When such changes take place, the requirements document needs to be updated. Other project documentation can also be affected due to design modifications, changes in requirements requested by the clients or other reasons. The team has to document all of the updates and to revise the relevant documents whenever revisions are due. To do this, the students needed a document version control tool, such as TortoiseSVN in Trac.

However, the exact way in which the students communicated the document changes among themselves and how they dealt with the fact that one change could affect other parts of their project was entirely up to them to decide. All the changes in the requirements did actually happen in the authentic industrial projects in this case and were simulated by the teacher in the hypothetical projects.

Design documents

During the design phase of this pilot case, the team produced many design documents, such as flowcharts, case diagrams, entity diagrams and relational database diagrams. All these documents were driven by the requirements documentation acquired in the earlier phase. The design documents were created by the developer team and communicated to the stakeholders for validation and approval. Again, revisions could be made throughout this phase and the team was obliged to maintain the accuracy and consistency of its design documents.

Consistency was particularly important during this phase as each team member took a different role and was responsible for a specific aspect of the design. Any changes to one part of the product could significantly influence other parts of the product. Because the team had to complete the phase within a limited time, they had to make sure that every part they developed could be done so with as few revisions as possible. When revisions did occur, they needed to make sure that any other part that could be influenced by the changes was examined in order to validate the component's proper working. Team members thus reviewed, negotiated and discussed each other's designs to see how they affected the section for which each was responsible before resolving any conflicts.

Building the software

During the subsequent phase, the developers predominantly buried themselves in their programming work. This work required team members to use separate applications and hardware in order to write, compile and test run their own components. If the developers encountered difficulties in building what was designed, they had to find another way to make it work. The new solution could be different from the original design, which meant the design document needed to be updated to reflect the new changes. Sometimes these changes affected other people's work.

If a developer was aware of the potential impact he or she may have on the work of the others, they issued job-tickets to alert other team members of the changes made. They also issued job-tickets to themselves to remind them of their job. When conflicts occurred, the individuals had to find a way to communicate and negotiate solutions with their team members.

Testing and pilot implementation

The last phase of the project was testing. At this stage, the team members were regularly issuing job-tickets to each other with requests to test various components (e.g., the database designer asked the web programmer to test how the database interacted with the web programmer’s program).

If a conflict, or what is known as a *bug*, was discovered, then the tester issued a ticket to the original builder of that component requesting him/her to fix the bug. Each bug had the potential to trigger a redesign in the other components affected, thus requiring a change to the documentation. This caused a ripple effect of changes throughout the designs. The final phase of the process was the pilot implementation, which was conducted at the client’s site.

Collaboration activity

The way in which the team managed all the phases was entirely up to them to decide and they could use whatever resources they had at their disposal. Because the complexity of the activity increased as they progressed through the phases, teams were expected to use simple forms of collaboration at first and then gradually increase the level of sophistication to deal with the increasingly complex interconnected tasks.

As previously mentioned, this study adopted activity theory to guide the research itself, as well as using it as the lens through which to examine the collaboration mediated by Trac’s wiki tool.

If we place these phases under the lens of activity theory and attempt to explain the activity using a generic activity theory framework (Figure 17), then we arrived at an adaptation of that framework for Case 1 (Figure 20).

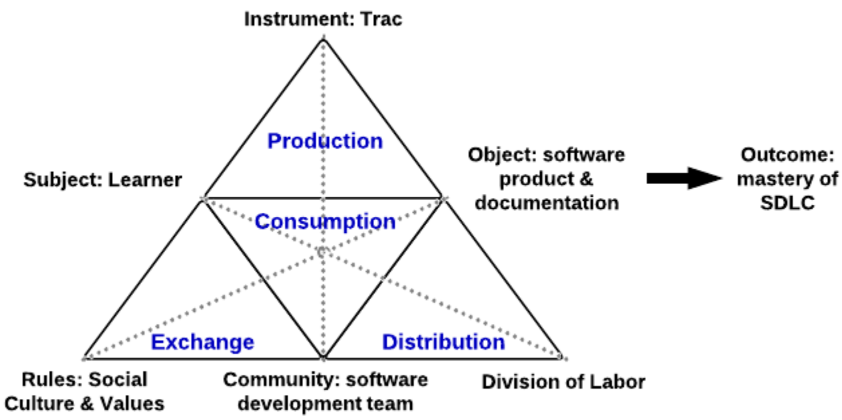


Figure 20 Activity system as framework for analysis of Case 1

In Figure 20, the activity system was selected at the level that corresponded to the meaningful learning objective for this unit. The unit aimed to apply its knowledge about the SDLC, gained in early units of the university course, to the project to gain mastery of the software development process. However, although the ultimate goal was to master the SDLC, the actual artefact to be produced as a consequence of this activity was the software product and its accompanying documentations, referred to as the *deliverables* for the project. Fundamentally, the deliverables were the objectified motive which the developers pursued throughout the activity.

The actor of this activity was the individual developer participating in a team of five members. Because the activity was an internal collaboration between the developers in a single team, other members of the team formed the community within which each individual interacted. This case study looked into the dynamics of the collaboration within each group. Therefore, it deliberately overlooked the participation of external stakeholders, as they were not part of the higher education learning environment and because the study did not have access to collaboration with external parties.

There were a variety of tools that potentially could have been used in this case. Each group was given the same basic tool, Trac, and the participants were required to reflect on all tools used, even though some teams may have adopted additional tools and then later abandoned them if they no longer served a purpose. Throughout the software development life cycle, there were several sets of rules that governed the way the developers communicated or worked with each other. These rules were the guiding principles of the standard SDLC practices. However, no instruction was given on how the teams should use the tools. The team as a collective created the rules or conventions it deemed necessary to ensure its collaboration achieved the intended objective.

Complicated tasks had to be managed as a group and it was therefore critical for members in this project to be able to coordinate their workload well, since workload balancing is also part of SDLC practices (Project Management Institute, 2008). The division of labour subsystem in Engeström's activity theory (1987) is the coordinating function, which essentially describes how the group manages and distributes workloads.

The process of coding or writing the syntaxes for the software program, as well as creating, updating and keeping the documentation relevant to the software source codes, was the production subsystem of this activity. However, other subsystems were just as important as the production subsystem to ensure the software was produced on time and as specified.

When a developer produced a piece of source code, the code itself needed to be shared with the other developers to be understood, tested and confirmed for its validity and *coupling*[1] with other pieces of source code. The process of sharing and distributing the intermediary and final artefacts among group members formed the collaboration subsystems of the activity.

The exchange subsystem was the communication process and the group dialogues that took place among members as they negotiated with each other. This communication could be mediated either by technology or conducted face-to-face.

[1] *Coupling* is the degree to which a program module relies on other modules. (Pressman, 2010)

4.4 Methodology

The methodology used in this case study was explained in Chapter 3, and the methodology section in this chapter is intended to place the previous methodology chapter within the context of this particular case study.

As previously pointed out, the study used activity theory as a guiding framework to guide the study as well as serve as an analytic lens through which the collaborative learning activity is observed.

4.4.1 Aim of the study

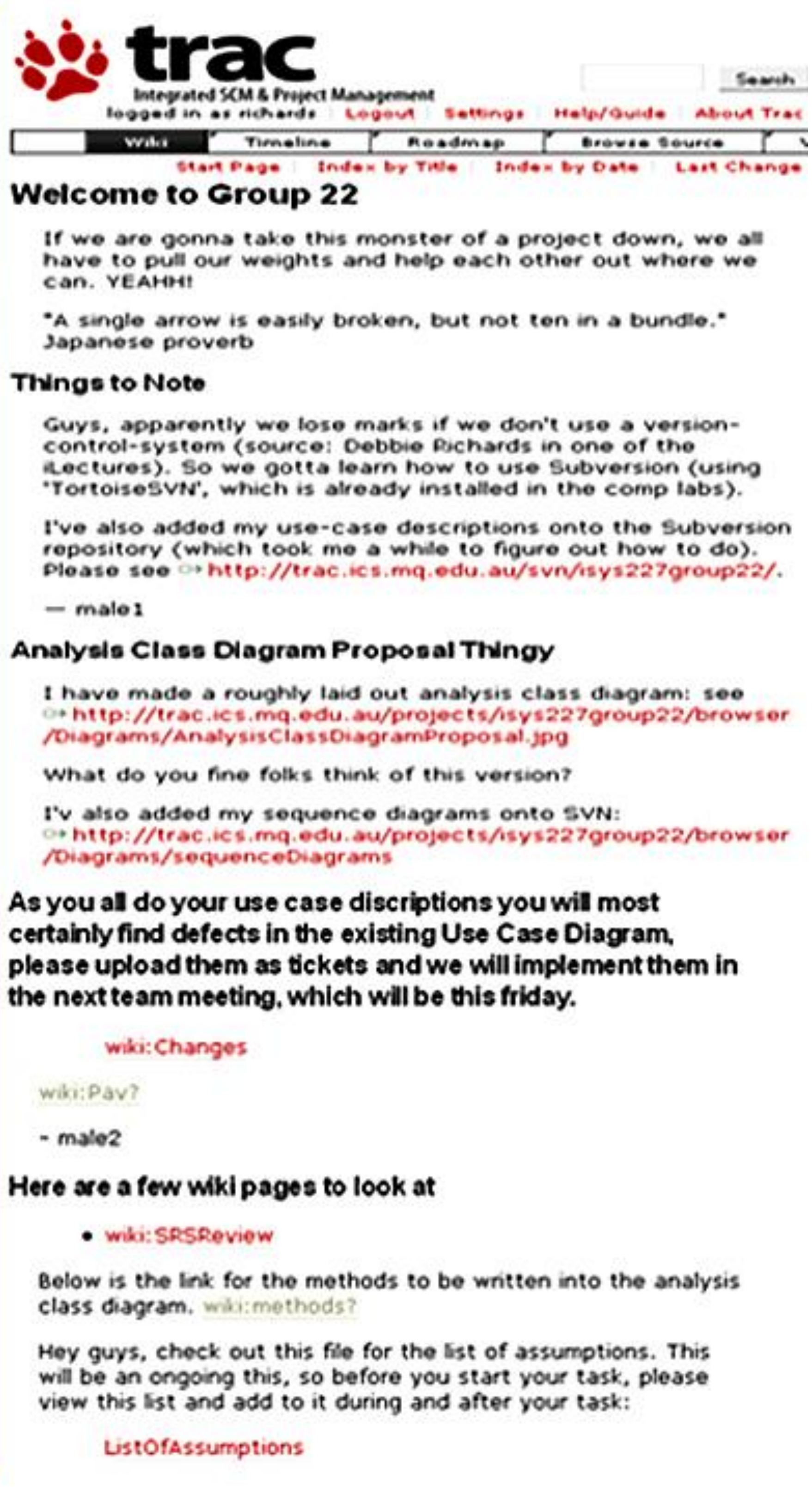
The aim of this case study was to examine:

- what affordances the wiki offered to students undertaking collaborative learning tasks
- what learning discourses these affordances supported
- how students perceived those affordances and used them in their collaborative learning activity
- what influence academics had in this process.

4.4.2 Data collection in this case study

This case study collected data via an online questionnaire, observation of system logs, edits to the wiki pages and semi-structured interviews, both with the individual students and with the academic staff member involved.

The questionnaire was conducted online and administered at the beginning of the semester. Each participant who consented to participate in the study was invited to participate in the questionnaire via an individual email. Each respondent was identified by a pseudonym so that his/her responses could be compared with the interview.



trac
Integrated SCM & Project Management
logged in as richards | Logout | Settings | Help/Guide | About Trac

Search

Wiki | Timeline | Roadmap | Browse Source

Start Page | Index by Title | Index by Date | Last Change

Welcome to Group 22

If we are gonna take this monster of a project down, we all have to pull our weights and help each other out where we can. YEAHH!

"A single arrow is easily broken, but not ten in a bundle." Japanese proverb

Things to Note

Guys, apparently we lose marks if we don't use a version-control-system (source: Debbie Richards in one of the iLectures). So we gotta learn how to use Subversion (using 'TortoiseSVN', which is already installed in the comp labs).

I've also added my use-case descriptions onto the Subversion repository (which took me a while to figure out how to do). Please see http://trac.ics.mq.edu.au/svn/isys227group22/.

— male1

Analysis Class Diagram Proposal Thingy

I have made a roughly laid out analysis class diagram: see http://trac.ics.mq.edu.au/projects/isys227group22/browser/Diagrams/AnalysisClassDiagramProposal.jpg

What do you fine folks think of this version?

I'v also added my sequence diagrams onto SVN: http://trac.ics.mq.edu.au/projects/isys227group22/browser/Diagrams/sequenceDiagrams

As you all do your use case discriptions you will most certainly find defects in the existing Use Case Diagram, please upload them as tickets and we will implement them in the next team meeting, which will be this friday.

wiki:Changes

wiki:Pav?

- male2

Here are a few wiki pages to look at

- wiki:SRSReview

Below is the link for the methods to be written into the analysis class diagram. wiki:methods?

Hey guys, check out this file for the list of assumptions. This will be an ongoing this, so before you start your task, please view this list and add to it during and after your task:

ListOfAssumptions

Figure 21 Sample Wiki from Group 22 (Kuswara & Richards, 2011b, p.323)

All groups were anonymously observed; the observations were conducted over a two-semester period to gain understanding of how the wiki was used by the group. However, no team member was individually identified. Figure 21 shows the example of a screen capture from one of the groups.

Two semi-structured interviews were then conducted separately towards the end of the second semester, each with a student. At the end of the semester an interview was conducted with the academic running the unit.

4.4.3 Procedure in this case study

There were 84 final-year undergraduate students enrolled in the class and all were engaged in the task to develop a software application for a client. Most of the students had been enrolled in another subject during the previous semester that also used Trac (Kuswara and Richards, 2011a). See Appendix C. Thus, they had some experience in using the Trac tools.

This pilot case study observed the usage of the tool through the system log and periodically sighted the wiki pages of each group's Trac. An example of the Trac wiki page can be seen in Figure 21. All communications between participants conducted through the Trac tool were monitored by periodically observing the changes made on the wiki pages, as well as by checking the access log of the tool. However, any interaction carried out by the participants through any other external tool was not monitored. Instead, participants were asked to reflect on these tools as part of their questionnaire and interview.

Three respondents voluntarily participated in the questionnaire conducted at the start of the first semester, and two questionnaire respondents, from different groups, voluntarily participated in the follow-up interview at the end of semester two. Although the number of respondents was small, they provided insights on the pattern of use of those particular groups of students as they negotiated the affordance of the tools, thus giving a more meaningful interpretation to the observation.

At the beginning of the first semester, the unit lecturer covered the technical aspects of using the Trac tools. During the second semester, the lecturer played a short video on what a wiki is to help the students better understand its potential uses. This was carried out before any data collection was done in either semester.

4.5 Results

This section presents the data collected during this case study, which consisted of observation of the wiki, the questionnaire that provided the background and opinions of the participants, and the student interviews that captured insights into the group's decisions on how to use the tools. While these steps were common to the three case studies, the interview result in this case gave a richer description of the considerations and deliberations that underpinned the group's decisions in relation to using the tools. Unique to this particular case, in section 4.5.3, therefore, are two stories that were constructed from two separate in-depth interviews to provide the richer nuances of how the technology was used.

4.5.1 Wiki observation

The observation was guided by the wiki observation framework discussed in Section 3.4.2 in mapping the usage to activity theory and provide insights into the team dynamics. It was observed that there were three different patterns of usage:

- The first pattern was to use the wiki solely as a **communication medium** between each member (subject) with participating members of a group (community), which according to Activity Theory, is a role that supports the exchange sub-system in the collaborative activities. A metaphor of a pin board can illustrate this usage, where being centrally accessible, the wiki was used to leave messages (as the object) for others in the form of wiki page creation or edits, and in some instances they made use of the wiki's comment features.

- The second pattern was the most popular usage, using the wiki as a **shared storage space**. Group members (subject and community) treated the wiki as a storage facility to allow them to pass files (object) on to each other as an alternative to sending files as email attachments. This use corresponded with the nature of the collaborative task in this case to produce a large number of design and project documents which were impractical to send as email attachments. A metaphor of a file bucket was used to illustrate this approach. This use was more sophisticated, as the group needed to organise its files using the wiki pages.

- The third pattern of use was the least used, namely using the wiki as a **coordination web space.** Here, the wiki took centre stage as a portal for the team (subject and community) to share various objects: designs, allocate production resources and monitor task assignments in addition to the last two usages, communication and cloud storage. This particular use tended to be heavily driven by one or two dominant team members who drove the team's coordination efforts.

  Within this usage pattern, one group used the wiki as collaboration web space where each member customised sections of the wiki to suit their role in the team, a kind of personal sub-wiki within the wiki. Each member of the group also actively contributed to the wiki, adding and editing pages and files. The wiki then became a personalised access gateway to various parts of the project, such as user requirement documents, design documents, test documents etc. This was done to support either individual tasks or to facilitate interaction between group members.

Similar findings were also made from two earlier cohorts of these units (2008 and 2009) when the same observation framework was applied to observe the use of the same tool (**Trac**) for the same collaborative SDLC tasks. The earlier cohorts consisted of 54 third-year students in 2008 and 122 second-year students in 2009. Summaries of these findings along with the observation findings of this particular case were published in two papers (Appendix C & Appendix D: Matching the affordances of wikis to collaborative learning):

- Kuswara, A. U. and D. Richards (2011). "Realising the Potential of Web 2.0 for Collaborative Learning Using Affordances." *Journal of Universal Computer Science* 17(2): 311-331.

- Kuswara, A. U. and D. Richards (2011). Matching the Affordances of Wikis to Collaborative Learning: A Case Study of IT Project Students. *44th Hawaii International Conference on System Sciences (HICSS)*.

4.5.2 Pre-activity questionnaire and interview

There were only three respondents to the questionnaire and they were all from different groups. The questionnaire in this particular case referred to all the types of Web 2.0 tools simply as "tools", unless Trac was explicitly mentioned. Hence, respondents' answers to the questions reflected their experience of using multiple Web 2.0 tools, rather than Trac alone. This ambiguity was detected and clarified in the subsequent case studies by revising the wording used in the documents and specifying the tool used. Despite that, the questionnaire in this case still provided insights into respondents' experiences, familiarity and attitude towards Web 2.0 tools in general.

The questions in this questionnaire offered multiple choice responses of Strongly Agree, Agree, Neither Agree or Disagree, Disagree and Strongly Disagree; these responses were assigned numerical values of 5 to 1 and their median, mean and standard distribution of data are presented below.

Table 2 shows the two questions (11 and 12) probing the familiarity of respondents with the tools, which, as previously mentioned, for this particular case study referred to Trac and any other tools they perceived as Web 2.0. Responses were just above the neutral value of 3.0, which was contrary to the expectation that computer science students would be more familiar with the various online collaborative tools. However, there was a possibility that respondents were not fully aware that the tools they used were classified as Web 2.0.

Table 2. Case study 1 – Familiarity with tools (n=3)

Questionnaire Question	Median	Mean	σ
11. I have used some or all the tools in another unit before.	4	3.33	2.08
12. I have used some or all the tools for social purposes before.	4	3.00	1.73

In Table 3, questions 1 and 2 probed the expected effectiveness of Trac as a tool for collaboration. The collaborative task in this case study was to produce, design, document and deliver a software product.

The data indicated that there was generally a positive response to using Trac as a tool to address respondents' collaborative needs (median = 4); subsequent responses expressed the need to use additional tools to supplement Trac.

It should be noted that the use of Trac is not common outside the academic setting; none of the respondents had ever used Trac before and had little familiarity with the tool.

Table 3. Case study 1 - Ease of use of tools (n=3)

Questionnaire Question	Median	Mean	σ
1. I found it easy to use the **TRAC** wiki to develop the project documents online.	4	3.67	0.58
2. I needed additional tools to support the development of the project documents.	5	4.67	0.58

Respondents' general expectations towards using and depending on Web 2.0 tools were canvassed in Questions 5, 10, and 13 and responses are shown in Table 4. Respondents generally either agreed or strongly agreed with the statement that they could substitute the tool with a manual process (mean = 4.33). Students tended to be more dependent on technology to support their document-keeping, but this view was not unanimous, as one respondent strongly disagreed with this statement. However, in the interview, respondents explained that the tools did play a critical role and were important for their team.

Table 4. Case study 1 - Usefulness of tools (n=3)

Questionnaire Question	Median	Mean	σ
5. I would not have been able to collaborate with my peers as effectively as I did without the support of the tools.	4	4.33	0.58
10. I prefer to coordinate teamwork with my peers through the use of the tools rather than manually.	5	4.00	1.73
13. I can always substitute the role of the supporting tools with manual process.	4	4.33	0.58

During the interview, respondents expressed that their dependence on the Trac tool was one of necessity rather than preference; one respondent explained that because his/her face-to-face meetings could take place only within the class schedule, in between those opportunities and during the semester break, they depended heavily on the tool. It was practically the only method of communication they could use.

Questions 9, 7 and 6 addressed perceptions of the tool. Upon reflection on their limited first use of the tools (Table 5), none of the respondents claimed to find the tool very useful for coordinating workload (mean = 2.33) or sharing project documentation (mean = 2.67), even though Trac was actually developed to help co-ordinate the SDLC workload. However, during interview, respondents retrospectively realised that they did not fully use all the Trac functions.

Table 5. Case study 1 – Perception of tools (n=3)

Questionnaire Questions	Median	Mean	σ
9. I found that the tools were very useful for me to divide the workload with my peers.	2	2.33	0.58
7. In my group, I used different tools to communicate with different people.	4	4.33	0.58
6. I found it efficient to use the **TRAC** wiki to share the project documents I had produced with others.	3	2.67	0.58

In question 7 about using Web 2.0 as a communication tool, the response was more positive; respondents said that they adjusted the tools they were using depending on the people they were communicating with (mean = 4.33).Other than the various technically-specific tools used in their programming, most respondents mentioned in their interview that they used standard productivity tools (e.g., MS Office) with which to collaborate and that they attempted to use the collaboration features of this tool, such as version control, to comment on each other's work.

However, in Question 8, respondents indicated that they did not think they would be influenced by the tool they used (Table 6).

Table 6. Case study 1 - Influence of the tool (n=3)

Questionnaire Question	Median	Mean	σ
8. I found that the tools we used have influenced the way I communicate and work with my peers.	3	3.33	1.53

During the interview, when further asked about the reason for choosing the tools to complement the mandatory Trac, respondents selected their tools primarily out of familiarity and convenience. That is, they selected the simplest tool that they felt would fit their style of communication, and none of them considered Trac as their primary choice. However, they all ended up using Trac, and acknowledged its sophistication in collaboration compared to other tools, such as email. The majority also noted that Trac increased in popularity once one or two of the members became early adopters of it.

Questions 3 and 4 addressed respondents 'perspectives on their contribution to the team's work as well as the contribution of others to the tasks they worked on (Table 7). All the groups coordinated their workload during a face-to-face group meeting where they discussed ideas and debated what was needed. They then assigned tasks or parts of the program to each team member and distributed the relevant information for that part via email or Trac. The next meeting included pulling things together and resolving any conflict while keeping updates on Trac. Depending on the workload and schedule of the group and each member at that given time, the workload would be assigned according to the person's experience and passion for that part of the project.

Table 7. Case study 1 – Collaboration (n=3)

Questionnaire Question	Median	Mean	σ
3. In my group, I worked together on the same task with others.	4	4.33	0.58
4. In my group, I was uniquely responsible for specific tasks.	4	4.00	0.00

During their interviews, respondents indicated that no-one in the group they were in had any communication breakdown during the project. However, they all indicated that they wished the communication had been better. Conflicts did arise and were mostly driven by technical discussions which could have been resolved through better and faster documentation, and by sharing or communicating information that was relevant to another member's tasks without adding more of a burden to their already stressful schedule. One of the respondents commented that, as they practically worked in isolation from each other, Trac allowed them to "*feel more like part of a team working on a real project*".

The following sections are drawn from the individual interviews conducted. Each interviewee painted a picture of the dynamics within the group to negotiate, adopt and renegotiate the use of collaborative tools. It should be noted that although each of the stories was told from the perspective of a single observer in that group, common themes will be drawn, in the integrated discussion (section 4.6.2).

4.6 Integrated discussion

4.6.1 Stories

In this case, two respondents participated in the interviews. They were given the chance to explain their usages of the wiki, reflecting on their own observed behaviour of use. The interview specifically posed questions around respondents' own perspectives of the collaboration experience with their team using the tools. They are presented here as independent stories with their own observed used of Trac.

Interview: Story-1 PS

The first story is from PS, who was part of the team assigned an authentic industrial project. The group began its activity with extensive planning to use various communication support tools. The group came together, discussed its workload and distributed responsibilities to each team member. Each team member then carried out the work on their own practically in isolation. Then at appointed times they came together to put together the result of their work and discuss any conflicts arising from their designs.

PS' group chose this approach because they argued that the project they were to deliver consisted of numerous parts. In their process, therefore, they created many supporting designs and project documents, which, as they put it, would have "*enough shared files anyway*" for every single member of the four-person team to be responsible for.

However, as noted earlier, the nature of the project required tight collaboration between members, such as when a web designer's design impacted on how the database manager managed the database. In computer terminology, there was a *tight coupling* between the programming components, or, in other words, a strong inter-dependency between them. Therefore, because the components were assigned to different team members as independent tasks, there was also strong inter-dependency between the tasks. The developer sometimes had to go through several iterations of the develop-review-modify process before the task could be finalised. This proved to be a challenge at first for team members and there was some friction within the team that needed to be resolved, requiring each member to adjust to the needs of others, as well as to the role each was performing. The group utilised *Eclipse*, an enterprise project support system, to help in their work, as this was mandated by their external stakeholders. However, they also utilised the Trac system extensively to facilitate the collaboration within their team and to manage the various documents they produced.

Because the working style of each member required independence from one another, Trac became crucial as the bridging mechanism between them. They did not need to have too many physical meetings, and each worked in their own way in their own time (or, as PS put it, "*try and develop, stay out of each other's way*"), while keeping their efforts coordinated through Trac.PS also noted that the team members were very proficient and comfortable in using the technologies. They had used a wiki before and were quite comfortable exploring the features and adjusting the way they used the tools to suit their needs.

PS: *There are other things. We didn't use it as extensively as we could have, certainly, but there's a fair bit of stuff up there so we found it quite useful I think.*

They also decided to use other tools, such as the MSN chat forum and standard email, to complement their communication with each other as the need arose:

PS: *Tortoise was down over a weekend or something and you're like, okay, it's probably not going to be fixed until Monday so we'll have to go on MSN and try and figure something out to get this done. So that was a bit annoying, but that's something you deal with.*

In retrospect, the respondents believed there was more they could have done in the wiki, although they noted the lack of features in the wiki to support the many diagrams they had to produce:

PS: *What we really probably should have thought about from an earlier stage is whether we could have moved a lot of the documents; whether we could have rethought the way that we did documentation entirely. But this is something which we can only really say in retrospect; whether we could have developed the documents, essentially, on the wiki itself.*

PS also found that the technology could not always help the team in all the steps of their work, indicating there were steps in the process where physical meetings became crucial:

PS: *So in terms of collaborating, one thing we found really useful, not so much in the tools but in the process, was just to basically sit side-by-side and have one developer explain what they were doing and the other developer comment on it and that's something which isn't really documented anywhere. It was something that we found really useful. I think they call it paired programming in the agile scrum methodology.*

Because they were attempting to create something new, there were a lot of stages where they needed to "trial-and-error" their approach and the technology that facilitated short messages became crucial in supporting the sudden surge of short bursts of communications:

PS: *Short messages and so on, that's what we found easier. The real thing about it is, because we had no experience with the stuff before, we weren't really sure if we were going in the right direction, if either person was going in the right direction, until the whole thing sort of works together.*

Interestingly in this team, the members utilised technology extensively at first to support their collaboration, but as the pressure of the due dates drew closer, they reverted to the more basic email technology.

PS: *It evolved into email basically, especially towards the end it was just all email.*

Interview: Story-2 AB

AB was part of a different group with a completely different experience to that of the previous respondent. AB's team was also one of the industry teams assigned to a client. AB's group consisted of five members.

The group started off with a very modest and unstructured approach. They argued that at the outset they did not know the other members personally or their preferences regarding group communication. Therefore, they selected email as their preferred tool to get things started and began by introducing themselves to each other. Communication was mostly unstructured at this stage.

As time progressed, they were faced with increasing workloads and the team began to realise the need to have a tool to support their collaboration processes. They began to explore Trac and to understand and value its usefulness. As buy-ins solidified, they attempted to utilise the tool more and more.

> AB: *But yeah, email was a big thing. But it wasn't until sort of late first semester, into second semester, that we really realised the value of Trac, I think, especially like the wiki and the tickets, that kind of stuff. You didn't really know how to use. Everyone just thought Trac was pretty crap. Only really useful for holding the files, I guess. But once we sort of got across that, I think it was very helpful. Like right now, when we're about to do the final presentation in a few days, Trac is sort of invaluable now.*

The very large number of emails that they had to cope with became increasingly a burden and outweighed the convenience of using something familiar. They then attempted to use Trac to organise the way they communicated with each other, even though they were first-time wiki users.

In retrospect, AB admitted that they should have used the tool much earlier in their project, but they did not do so despite the introductory workshop session to the tools given at the start of their class session. They completely ignored the workshop as they did not see any need to use the tool at that time. Initially, they did not have the need to organise their work and they also did not recognise any of the tools' affordances. Hence, they did not seek to use of the tools. When the need arose, however, and it became more pressing, they began to seek options and they objectified their need to use the tool.

> AB: *A lecturer or a tutor or something goes through how to actually use it properly. Because you sort of don't really use it, you know what you can do, sort of. But until you actually do it and you have the projects especially where you need to make use of that kind of stuff, that you don't really use it.*

AB's team also had an interesting evolution in its adoption of the wiki. They started to use the wiki when one of the members decided to use it as a reference location to list team members' names and contact details. Then the team began to expand this same affordance of the wiki to put up meeting notes and schedules, rather than sending multiple emails to each member. As a consequence, their usage grew and they started to use the wiki to accommodate the organisation of suggestions and ideas. In addition, instead of just commenting on each other's ideas, they began to link those shared ideas with the job tickets, as some of the ideas they generated needed to be placed within a context to make sense. This dialogue-style communication then evolved into online brainstorming sessions, which they referred back to and reused.

> *[So was it – how do you then see it now, the wiki part?]*
> AB: *Yeah. Oh, valuable really. Yeah.*
>
> *That we've played around and added things and sort of just, for fun almost, adding them and then realising that they were actually really useful.*
>
> *Yeah. I found it really useful. I mean, it's a lot easier than just sending a million emails back and forth. A good example is when we were doing our last demonstration; we had to find something from one of our documents of something. It was everyone was searching through their inbox, trying to find it. If we just, from the start, had had it in the wiki, it would have been boom, we could have found it; whereas, it's dumb searching all the way through the inbox for an important part of an email. So yeah, I mean that was a sort of highlight of why.*

AB's team also appreciated the critical role of physical meetings at particular stages in their project. However, they mostly preferred to have enough space to work independently while maintaining collaboration through technology.

4.6.2 Integrated discussion for case 1

The integrated discussion here is based on the findings from this case and the relevant two cohorts of students from the previous semesters (Kuswara and Richards, 2011a, 2011b) who also used the same tool, Trac.

Overall, respondents considered Trac to be a relatively easy tool to use (Kuswara and Richards, 2011a). They considered it quite comfortable to use and could quickly grasp the basic technical features of the tool. This rapid familiarity with the tool was probably enhanced by the fact that they were computing students who were accustomed to Internet-based applications. Respondents also had a positive attitude towards using technology as part of their collaboration assignment and preferred the existence of a supporting tool rather than having to collaborate solely by face-to-face.

Perception and discovery of affordance

The study indicated that, initially respondents did not even try to experiment with new tools; they selected only tools with which they already familiar and had prior experience using. This was true regardless whether the instigator of the collaboration within the group had strong technical influence or not. However, when they were loosing the consistency of usage, their utilisation of the tool diminished. Respondents did not seem to have thought about how the selected tool would support their group's collaboration process; because they selected tools as a reaction to an immenient needs rather than planned approach anticipating a future needs.

As computing students, they seemed to have a relatively low expectation of their usage of the tools to support their SDLC collaboration, particularly when they were selecting tools to assist the coordination of their project workload and for sharing documents. When they were responding to the questionnaire, they encountered a few opportunities to interact with the Trac system and had enough time to consider other tools. However, they were generally sceptical about using the trac tool. They therefore missed many opportunities to perceive the affordance offered, only to realise its value later in retrospect. With time, as a few 'brave' early adopters started to use the tool, others then started to get involved and extended its use. Not all members of the group perceived the affordances of the tool equally at first. Hence, in an environment where exploration and trials were consistently encouraged, such early adopters could have helped to promote the 'newly discovered' affordance.

Norman (1988) presented the notion that affordances are factual properties waiting to be discovered, which is in contrast to Gibson's notion of an affordance as a perceived construct (Gibson, 1979; Greeno, 1994). However, observations from this case study indicated that the notion of discovering an affordance did exist, but it existed at the collective level, rather than at the individual level as Norman initially argued. An individual participant can construct perception about an affordance, but the group, of which that individual is part, cannot perceive as a single mind (Stahl, 2006). Instead, the group discovers the perceived affordance, which is perceived by one of its members, in order to utilise that affordance in the collaboration. Once the individual perceives an affordance independently and promotes it to the group, then the group discovers and utilises it. Thus, it does not take a group-wide revelation to change the behaviour of a group towards the use of a tool.

Usage of the tools driven by needs

The study also showed that respondents considered collaboration a personal process. They considered their own style of communication and both anticipated and adjusted to the communication style of others. Therefore, the affordance perceived by an individual and what then triggers its utilisation may be different from one person to the next. This supports Gibson's (1979) definition of 'affordance' as complementarities of the actor and the environment. Interestingly, one of the respondents mentioned that because the group met face-to-face less frequently than was desirable, members were in practice isolated and geographically separated. One of the respondents believed that having Trac allowed them to feel as though they were part of a team instead of sinking in their isolation.

The notion of 'one size fits all' did not occur, nor did participants expect that to occur. They expected that they would need a set of tools rather than a single tool to support their collaboration. As the respondents in this case came with this understanding in mind, it was expected it would be easier for them to find a match for their needs, and thus the utilisation of the tools would be more sustainable. What transpired was that one of the groups, which started with the expectation of massive utilisation of various tools in their collaboration, ended up being overwhelmed by the time and effort required to keep the tools in use. In contrast, while another group started its utilisation with a need and, as the members objectified their needs into a motive and satisfied them through the offered affordance of a tool, that tool's usage was then solidified into the group's collaboration through continued practice.

A pattern of adoption typified by a plan to use the technology at the outset seemed to be driven by a champion in the team. The strong advocates voiced their opinion on how to adopt the tool within their team process and pushed the team towards the envisioned direction. However, SDLC collaboration infers a democratic process requiring the majority, if not all, to support and buy into the activity. Without such a diffusion of needs permeating the group thoroughly, the collaboration itself is unlikely to be well sustained, and sustaining utilisation of the tool even less likely.

In this particular case, the participants seemed to follow the stereotypical attitude of programmers towards documentation and keeping the documentation up to date. This, as was observed in the previous cohorts of students, is something that they dreaded. However, given the circumstances and workload they had to face, there was no alternative. They had to rely on the documentation and realised the critical role the collaboration tool, wiki, played.

Students' selection of the tool

Even though students who used the tool were proficient in its use, there were apparent difficulties in sustaining the use of the technology to support the collaboration. Therefore, when pressured by time and when overwhelmed by this overhead, the group resorted back to a support system that required the least *effort to maintain*. They reverted to basic email.

When using technology, we cannot always assume it will cost less. The cost can only be justified when it is weighed up against the benefit it offers through its affordances. Nevertheless, the cost still exists and when circumstances change, the cost-benefit consideration might tip the scales to the other side and influence the user's decision in using a tool.

The groups' selection of tools was not always driven by a *conscious selection* based on the tool's affordances. This is noted when they had to select auxiliary tools to complement the main tool assigned to them. In most instances, it was observed that they were driven by their familiarity with the tool or by convenience. They then figured out how to maximise usage of the tool to accomplish the task. Therefore, the tool selection preceded their communication planning.

Expectation of tasks influences perception of affordance

Previous research has revealed that a student's approach to learning is a reaction to how the student has perceived the task, rather than an inherent attribute of the student (Kirkwood, 2009; Laurillard, 1979; Perry, 1970).

This study explored how students perceive affordances and use them in a collaborative learning activity and it revealed that, although individual preferences or habits do exist, the choice of a learning approach is dominantly driven by *individual and contextual response* towards what the students perceive is required of them. How they perceived the task and how they thought that they would be assessed on the task influenced their decision-making. Therefore, it also influenced how much effort they put into the task and how they used the technology at their disposal to support their learning.

When the respondents were deciding on the tools and how to use them in their tasks, it was likely they had already formed a perception of what they could expect from these tools. These preconceived ideas constrained them from discovering or constructing the affordance of the tool they were using.

Students of 2009's ISYS346, COMP340 and COMP345 were expected to produce diagrams and design documentation, even though it was not explicitly mentioned in the unit outlines. Traditionally, when software developers build a system, they create parts of the system documentation in the form of separate files. In many cases, the content in these separate files needs to be constructed in such a way as to form a single coherent report when the separate files are combined. Similarly, the students in this case faced the prospect of dealing with a large number of files utilising the tool at their disposal.

As they were using Trac, the students had to consult the system's inbuilt user manuals. These documents were built inside the Trac wiki as pages of the wiki itself, rather than as a separate help file or downloadable pdf files. The students were, in fact, looking at an example of extensive documentation built as a wiki. However, not a single group used the wiki as a platform to document its designs. Instead, many of them used the wiki to store the numerous files they created with other tools. Although some of the documentation they produced could not be supported by the wiki (due to the technical nature of their design diagrams), an extensive number of documents that were produced by standard word processors could have been created directly in the wiki. If the students had utilised the wiki in this way they would have provided support for their production and consumption activities at least, lowering their overhead in dealing with multiple tools and achieving their need to communicate and share their documents within their group. This was not the case, although they did, in retrospect, independently acknowledge the possibility as apparent from the interview.

Automating and communicating affordances

The study revealed that the affordances that Kuuttii (1995) labelled as "*automating*" and "*communicating*"were the two most frequently perceived. Participants were quick to perceive and adopt them in their collaboration. The *use-cases* in utilising the wiki as a shared space can be ovserved, in which the purpose of file exchange or as a place to post notifications to be seen by others is commonly practiced across the groups. This finding was consistent with the two previously published studies during the first and second semester of 2008, in which 54 and 122 undergraduate students respectively were enrolled (Kuswara and Richards, 2011b).

In the first semester 2008 study, out of the 20 groups observed, the most popular usage of the wiki was for file sharing (40%). Use of the communication notice board was the second most popular (35%). Similar findings were repeated in the second study where, out of 29 groups, 57% used the wiki as a file-sharing tool, while 21% used it purely as a communication medium (see example in Figure 21) and 39% used it mainly as a means to communicate instructions and coordinate workload.

Sense-making affordance

In the previous studies (Kuswara and Richards, 2011b), very few participants, if any, utilised the wiki as a *sense-making* tool. The first study in 2008 revealed that only one out of 20 groups observed constructed their wiki to allow them to collaborate for sense-making. No such affordance appeared in either the second semester 2008 or the current 2009 study; however, in the current study, the interview findings did indicate that the participants realised this potential in retrospect.

As mentioned before, the participants' inability to perceive this was due more to a lack of expectation, rather than technical unfamiliarity, and this extended to other tools utilised. When the group experienced disruption in the availability of a tool that enabled support for automation and communication, they reacted quickly and found alternative means to satisfy that need. However, there was no sense of urgency, or even a perceived need, to utilise the tool to support sense-making. Moreover, when the due date drew closer and time became a scarce resource, team members resorted to face-to-face meetings. This strategy was apparent with numerous groups as their wiki became less up-to-date and the system logs recorded less interaction. The option to resort back to traditional face-to-face meetings and emails was not always the best option; the nature of the collaboration involved a vast amount of diagrams and documentation that overwhelmed the email system and were inconvenient to carry around in printed form. This indicated that their decision to return to less sophisticated tools was not driven by a thoughtful process, but rather by a reaction to the situation they were facing.

Mismatch of affordance

The respondents themselves seemed to be unaware of a mismatch between what they needed and what they made the effort to do. Respondents displayed an understanding of what was asked of them in relation to the task. They were also able to translate this into what they needed to do. They also were seemingly well aware of the tool and even some of the workings of the technology behind the tool. They were sufficiently familiar with, and able to use, the tool comfortably. However, despite all of these, they did not make the connection between the tool's capability and their collaboration needs. This inability to take the extra step from realising the specific affordance of the tool to ustilising them to satisfy their collaboration needs is due to their inability to negotiate between their perception of the approach towards the task and their perception of the affordance of the tools.

There are several themes coming out from the first case study, which will be revisited in Chapter 7, after independently discussing the other case studies in the following two chapters.

5 Case Study 2: Wiki to support professional experience

5.1 Introduction

The second case was conducted in 2009 within two final-year units of the Bachelor of Arts, Diploma of Education programs in the Department of Education: TEP414 and TEP415. The units were consecutive professional experience subjects. In these units the students, who were pre-service teachers, were required to undertake practical work at a primary school for at least 40days under the guidance of a supervising teacher in that school. The purpose was to give the pre-service student teachers the opportunity to implement strategies and techniques that they had learned in other 400-level professional units. The units had a classroom meeting schedule of one hour per week allocated as an on-campus tutorial. These tutorials were the only formal scheduled time for students to meet with their peers as well as with the lecturer to discuss their experiences and to work on the tasks required to complete the professional experience units.

This chapter is structured to give the relevant background literature, explain the collaborative task, contextualise the research methodology and, finally, discuss the findings.

5.2 Pre-service teacher professional experience

Collaboration is considered an important part of both practicing and pre-service teacher professional development in Australia (Jones, 2008). Moreover, since there is a scarcity of time when teachers can 'pull-out' from their class to attend professional development training, many educators would have considered that the most suitable professional development model to adopt is the one that can support their everyday activity. It has been argued that such collaboration is the most sustainable experience that most teachers can have in their careers, particularly if it promotes collaboration between and across practicing and pre-service teachers.

Another important component of a teacher's professional development is *reflective practice*. The practice has had significant growth in the past decade and has already been linked implicitly to effective professional development (Brookfield, 1995; Ingvarson, Meiers, & Beavis, 2005; Jones, 2008;

Korthagen, 2001; Osterman and Kottkamp, 1993). Through reflective practice, pre-service teachers have the opportunity to examine theories underpinning practice and to reflect upon their own teaching practices. Brookfield (1995) argued that it is through this critical reflection that teachers are able to identify and consider the appropriateness of the assumptions that guide their behaviours when teaching.

Reflective practice consists of a cyclic pattern of experience and a conscious application of that learning experience (see Figure 22). John Dewey (1933) formalised the idea of reflection as part of a complex and authentic learning process that is carried out daily and naturally in our lives. The idea then conceptualised into a professional reflective practice though the work of Donald Schon (1991); this idea advocated reflection-in-action, which acknowledges the uncertainty and complexity of a person's practice which in turn leads to a form of *professional knowing*.

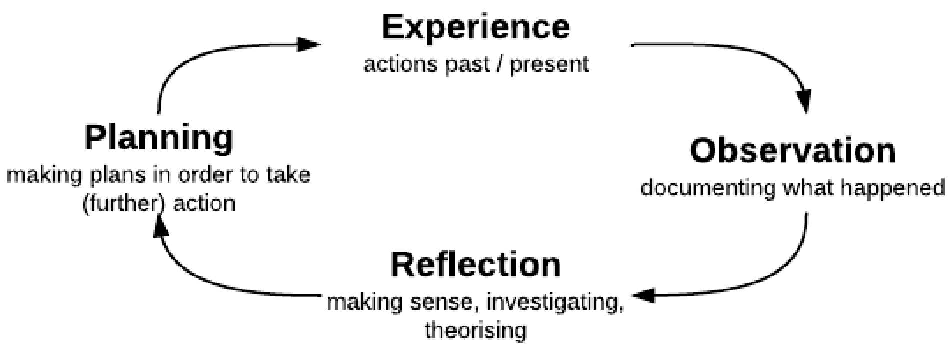


Figure 22 Reflective practice cycle (Beale, 2007)

Web 2.0 technologies both promote self-publication and connection and bring together an audience to provide the social context in which the reflection can be more meaningful. Research on Web 2.0 tools such as blogs and wikis also identifies a correlation between the tool and the encouragement of learning through reflective practice (Beale, 2007; Ras, Carbon, Decker, & Rech, 2007).

5.3 Learning tasks

In this particular case, the lecturer incorporated reflective practice into the unit. When designing the unit, she recognised that the enrolled students may not have known each other well enough to allow collaboration and effective reflection sharing. Even though some of the students had been in the same class during the previous semester, they were unlikely to have been open and comfortable enough with each other to share their career-related personal reflections.

The rapport between participants in this collaboration activity was crucial as it held the key to successful trust-building and effective sharing. Therefore, it was through the use of the wiki that the lecturer hoped and expected the students would quickly build their relationship and establish a platform upon which to support their sharing of professional experience.

Within a non-competitive environment, the students were expected to contribute voluntarily various types of resources that they personally found useful in their teaching practice. The students were encouraged to take ownership of the wiki and, after experiencing the use of wiki in their own collaboration, it was hoped that they would then be inspired to adopt wiki later in their own classes as practicing teachers.

Each participant was assigned to a different school for their professional practice and to teach students at different stages of development. Therefore, students who were teaching the same stage were grouped together and given a starting page for their group in the wiki. All members of the group had equal access rights as editors to build, expand and link online resources collaboratively.

The lecturer who was conducting the tutorial sessions in the classroom used the wiki consistently to deliver material and to reinforce the experience in using the tool. It was expected that each participant would then actively access and read the wiki regularly because it was via the wiki that all tasks and announcements were given (no other medium, not even email, was used by the academics). The students were not required to complete all the tasks using the wiki, but most tasks required them to utilise the wiki one way or the other.

The examples of artefacts that the students were expected to share through the wiki were: lesson plans that they used in their teaching practice; teaching resources produced or discovered online; comments and reflections on the resources or ideas in regard to class management; critical reviews of websites which they found to be related to and useful in their teaching; shopping lists or item lists of the things they used while teaching; documented morning routines they found effective in their practice; and specific classroom management techniques they found or utilised with their class.

The unit teacher did not mandate how the group was to use the wiki; Rather, the students were encouraged to take ownership of their section of the wiki and develop it in ways suitable to their own needs as individuals and as a group.

According to the program handbook at the time of the study, the focus of the unit was on teaching practice where pre-service teacher students experienced and carried out practical teaching tasks. Therefore, the wiki tasks were primarily voluntarily activities offered for the benefit of the students professionally as well as individually. It is also noted that, at the time of the scheduled on-campus tutorials, the class did not always have access to computers and students would sometimes need to provide their own computing devices.

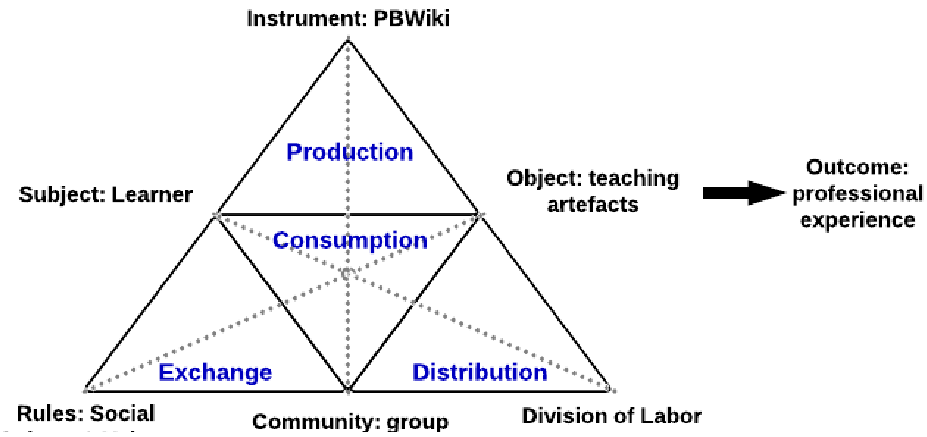


Figure 23 Activity system as framework for analysis of Case 2

In a summary of this particular case, activity theory was used to guide the research itself, as well as using it as a lens through which to examine the collaboration mediated by the wiki. The framework itself was previously explained (Figure 17) and the explanation here is intended to contextualise it within Case Study 2 (Figure 23).

The collaborative activity in this case was examined at the level that corresponds to the learning objective of the unit, which is meaningful to the learners (the student teachers). In relation to the activity theory Framework shown in Figure 23, the learning objective of the unit was to allow the students to construct a concept which combined the teaching theories they learnt with their experienced realities of teaching practice. This process then enabled the students to produce various files or *teaching artefacts*.

The artefact could be an original work that the pre-service student teacher produced, such as a lesson plans used in the classroom or relevant resources used in their teaching such as documents, images, or other multimedia files they downloaded from the Internet. Alternatively, it could also be their reflection on any of the previously mentioned artefacts. These artefacts were either attached to or linked from the wiki.

The actor in this activity was the individual pre-service student teacher, henceforth referred to as the "*learner*"; the students with whom they interact at their school are referred to individually as the "*student*". Each learner was assigned to a group with another learner who taught at the same stage but in a different school. Throughout each stage, the learner would need to interact with students of different age groups (see Table 8) and so different strategies and challenges needed to be addressed.

Table 8 Stages of learning (NSW Department of Education and Communities)

Typical age	Year of school	Stage of learning
4-6	Kindergarten	Early Stage 1
6-8	Years 1-2	Stage 1
9-10	Years 3-4	Stage 2
11-12	Years 5-6	Stage 3
13-14	Years 7-8	Stage 4
15-16	Years 9-10	Stage 5
17-18	Years 11-12	Stage 6

Therefore, to keep the focus of the collaboration on their professional experience, the group allocations were arranged according to their stages. The number of learners in each group varied from group to group, ranging from a minimum of two to a maximum of three. Other than the unit lecturer and the researchers of this study, there were no other stakeholders participating in the wiki, as the content in the wiki was deemed to be private and not to be shared with others outside the class.

Learners were free to use any additional tool to support their activity, but the use of wiki as the main tool was mandated. This case study required the participants to reflect only on the wiki tool that they all used, unless specifically asked otherwise.

The lecturer set a few basic rules to manage the communication between and within groups. Administrator rights were also reserved for the lecturer, while learners were given editor privileges that allowed them to create and edit resources within the wiki. How the artefacts were organised and managed was left to the group to determine, as was the process of negotiation and collaboration.

In this particular case, there was little emphasis given to the division of labour because only a few tasks needed to be coordinated amongst the group. Many learners also tended to be self-motivated to satisfy their own individual need to improve their professional experience while they were using the tool. Therefore, the issue of fairness and equal workload was not of particular concern.

Creating the wiki pages, attaching resources and presenting the information for others to access on the wiki were the primary production activities and were mostly conducted directly on the wiki itself. The wiki used was the free version of PBWiki (https://my.pbworks.com/), and each learner had his or her own individual login. This wiki also supported the communication activities through the 'commenting' features available.

5.4 Methodology

The methodology used in this case study has been explained in Chapter 3, and the methodology section in this chapter is intended to contextualise the previous methodology chapter within this particular case study. As previously pointed out, the study used activity theory as a framework to guide the study and serve as an analysis lens through which the collaborative learning activity could be observed.

5.4.1 Aim

The aim of this case study was to examine:

- what affordances the wiki offered to students undertaking collaborative learning tasks
- what learning discourses these affordances supported
- how students perceived those affordances and used them in their collaborative learning activity
- what influence academics had in this process

5.4.2 Data collection

This case study collected data from observation of the wiki through system logs; from physically looking at the wiki pages, from an online questionnaire and from a semi-structured interview. Observations were carried out for the duration of two semesters, which covered two consecutive units.

Through the observation of the wiki pages it can be seen how the wiki was used by the group. Each team member's contribution could be observed distinctly, because the task was to share personal experience, and respondents placed a personal marker to indicate their contribution in the wiki pages. All teams in the cohort consented to observation and they were informed about this study, although they were not told when the observation was undertaken. This observation data provided basic factual information on the final and interim artefacts produced through the activity.

A questionnaire was conducted online and administered early, at the start of the first semester. Each participant who consented to participate in the study was invited by individual email to participate in the questionnaire. Each student responded individually and was identified by name, thus allowing their responses to be compared with the responses in the interview. Participants' responses were then coded to ensure anonymity. The questionnaire allowed researchers to gather background information about the participants and their opinions on collaboration and the use of the tool.

A semi-structured interview was conducted towards the end of the second semester to acquire insights into how and why the tool was used as it was, and to give participants the opportunity to comment further on the observed usage compared to the questionnaire.

5.4.1 Procedure

There were 24 learners enrolled in the class when the study was conducted, that is, between Semester 1 and Semester 2, 2009. Learners were required to work in a group to develop a shared repertoire of teaching and professional resources in the form of online documents and documented experiences relevant to their practice when teaching in different primary schools. For this purpose, they were assigned to groups based on their chosen stage-year (see Table 8 in chapter 5).

There were 13 participants out of 24 who gave consent and subsequently responded to the questionnaire. The questionnaire was conducted near the start of the first semester (TEP414), and eight of the participants later took part in the semi-structured interview at the end of the second semester (TEP415). At the beginning of the first semester the lecturer demonstrated the capability and features of the wiki tool to be used, and conducted a small workshop which allowed the learners to familiarise themselves with the features of the wiki.

To capture the required data, the study also deployed several instruments, as explained in Chapter 3. Document analysis was first carried out by the researcher prior to the start of the semester to identify the schedule and the understanding required of the learning tasks in the unit. Further discussion with the unit convenor was conducted to allow better understanding of the objectives of the unit.

The researcher was then given access to the wiki to visually observe the changes to the wiki pages. The wiki system has its own built-in system log which records any creations, edits and deletions made by learners and the lecturer. The researcher then began to observe the usage of the tool through this system log and periodically sighted the wiki pages of each group. The unit used only a single wiki and the whole class participated in it. The lecturer created several pages and assigned one to each group. Every group then had the freedom to expand and use it as the participants saw fit.

An online questionnaire was then deployed; individual learners were sent a personal invitation to give formal consent to their involvement in the study, as well as to respond to the questionnaire. The detailed questions of this questionnaire can be seen in Appendix A: Research Instruments.

No observations were made during the break between semesters. The learners then re-commenced tutorials in the following semester. The second unit was separate from the first; however, the majority of learners continued and enrolled as the same cohort. Some additional learners joined in at the second semester but they were not included in the observations, questionnaire or interview. At the end of the second semester a semi-structured interview was conducted in which 61% of the questionnaire respondents took part. The interview sessions were conducted in clusters of two to three participants who did not necessarily come from the same group. This format was adopted due to the limited amount of time available to the participants.

5.5 Results

The participants' technology backgrounds were very diverse, ranging from those who considered themselves technology enthusiasts to those who were practically technology-averse and had great difficulty in dealing with the tools. However, the study did not intentionally select respondents with any particular level of technological expertise, choosing instead to accept all participants who were willing to participate voluntarily in the study.

5.5.1 Questionnaire

The tool referred to in this case study specifically refers to the PBwiki used; therefore, respondents primarily reflected only on the wiki (unless asked otherwise). The questionnaire provided insights into the respondents' experience in regard to their familiarity and attitude towards the use of a wiki, although not necessarily the exact brand of wiki they used in the unit.

Respondents were given multiple-choice responses of Strongly Agree, Agree, Neither Agree or Disagree, Disagree, and Strongly Disagree); these responses were assigned numerical values of 5, 4, 3, 2, and 1 subsequently and the median, mean and standard distribution of the resulting data is presented below.

In this second case, Table 9 illustrates two questions about respondents' familiarity with the wiki. The median response indicated middle value 3; the mean emerged slightly lower, indicating a tendency towards the less familiar and having no prior experience with the tools for either academic or social purposes.

Table 9. Case study 2 - Familiarity with wiki

Questionnaire Question	Median	Mean	σ
11. I have used some or all the tools in another unit before. (n=11)	3.00	2.64	0.92
12. I have used some or all the tools for social purposes before. (n=12)	2.00	2.42	0.90

Although the respondents were relatively new to the wiki, they were familiar with basic ICT tools such as email, web browser and messenger.

In Table 10, questions 1 and 2 probed the expected ease of use of the wiki as a tool for collaboration. The data, with responses slightly above the middle value, indicated that there were generally positive expectations.

Table 10. Case study 2 - Ease of use of wiki (n=12)

Questionnaire Question	Median	Mean	σ
1. I found it easy to use the wiki to develop the project documents online.	4.00	3.50	0.67
2. I needed additional tools to support the development of the project documents.	3.00	3.17	1.03

Respondents 'general expectations about using and depending on the wiki were probed in questions 5, 10, and 13, as shown in Table 11. Responses tended to be in the middle (neither negative nor positive), with a slight tendency to expect non-reliance on the use of the wiki in their collaboration.

Table 11. Case study 2 - Usefulness of wiki (n=12)

Questionnaire Question	Median	Mean	σ
5. I would not have been able to collaborate with my peers as effectively as I did without the support of the tools.	3.00	2.83	0.72
10. I prefer to coordinate teamwork with my peers through the use of the tools rather than manually.	3.00	3.08	1.00
13. I can always substitute the role of the supporting tools with manual process.	3.00	3.25	0.87

Questions 9, 7 and 6 addressed perceptions of the wiki as a medium of communication and sharing documents. The data indicated that respondents responded positively towards the wiki for such coordination use (Table 12).

Table 12. Case study 2 – Perception of wiki (n=12)

Questionnaire Question	Median	Mean	σ
9. I found that the tools were very useful for me to divide the workload with my peers.	4.00	3.42	0.79
7. In my group, I used different tools to communicate with different people.	3.50	3.50	0.80
6. I found it efficient to use the wiki to share the project documents I had produced with others.	4.00	3.33	0.89

About half of the respondents also indicated that they needed to use different tools to communicate with different people in their team at different times (Table 12).

Half the respondents also claimed that they were uncertain about how the tool would influence the way they interacted with their peers (Table 13).

Table 13. Case study 2 - Influence of the wiki (n=12)

Questionnaire Question	Median	Mean	σ
8. I found that the tools we used have influenced the way I communicate and work with my peers.	3.00	3.08	0.67

Questions 3 and 4 addressed respondents' perspectives on their contribution in the group's collaborative tasks (Table 14). The tasks were primarily built around sharing the various aspects of their practical experience at the schools. From the data in this case study, respondents clearly had positive expectations of their collaboration and their peers.

Table 14. Case study 2 – Collaboration (n=12)

Questionnaire Question	Median	Mean	σ
3. With my peers, I value their contribution to my own work.	4.00	4.42	0.51
4. With my peers, I can contribute to improve his/her work.	4.00	3.92	0.67

Summary

Overall, respondents gave positive responses regarding their expectations of collaboration with their peers; respondents did not indicate a negative attitude towards using the wiki, but there were reservations regarding their expectations of using the tool to support their collaboration.

It needs to be noted that a significant majority of the respondents were new to using a wiki. As a result, their uncertainty about its use was somewhat expected.

5.5.2 Observation

In this section, several screenshots from the observation are presented; however, any references to personal identity of participants, including online identity, have for privacy reasons been intentionally blurred. Additionally, although some of the screenshots might be too small to be read clearly, explanations and descriptions are given in the text.

The intention of this observation was to see how far the group could use its wiki to facilitate its collaborative activity; not to see a progression of changes on the page over time. Therefore, only a single screenshot is shown for each, rather than a series of time-lapse screenshots.

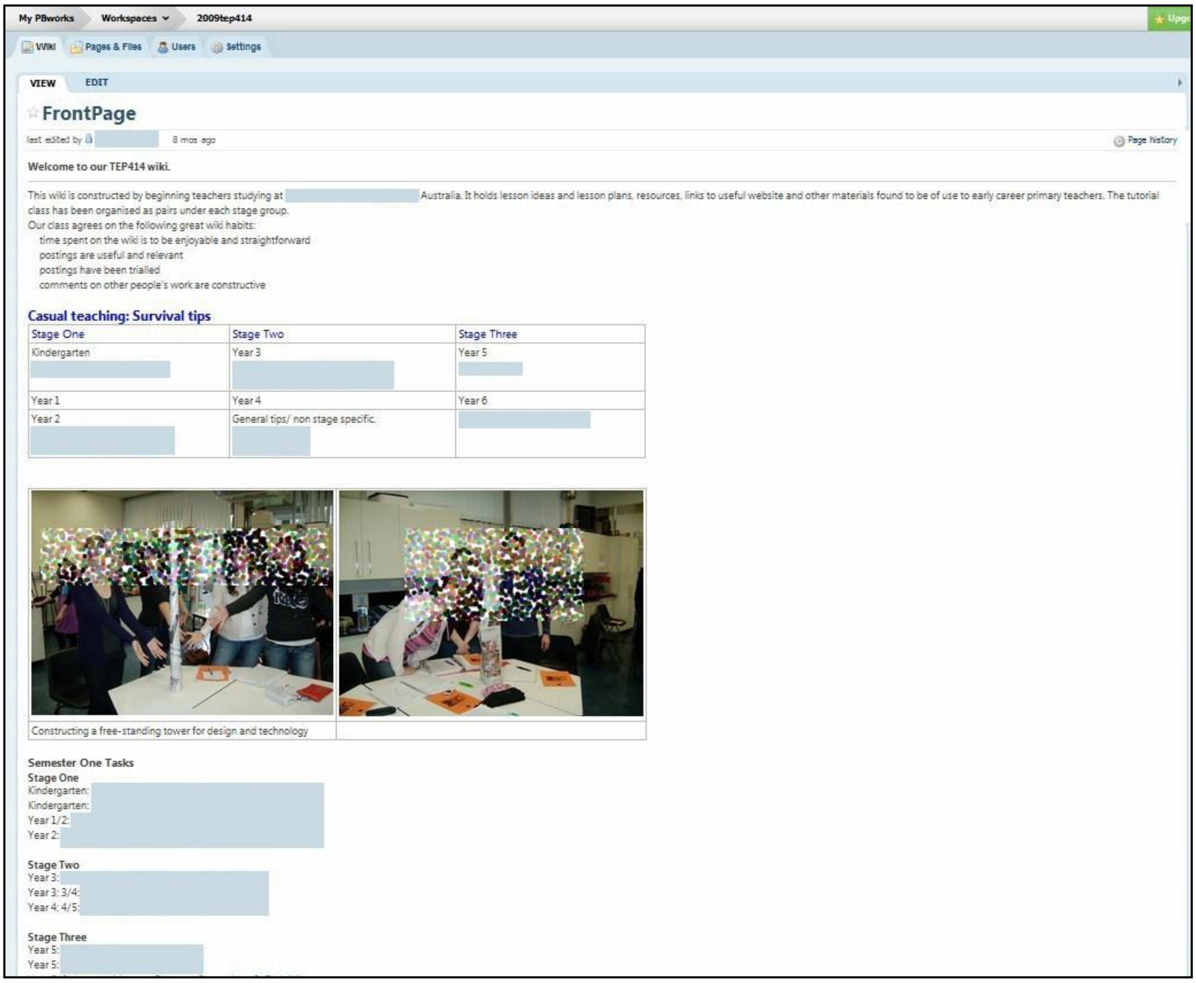


Figure 24 Case 2 - Front page

Figure 24 shows the front page of the wiki created by the lecturer of this unit. This page served as a central hub to inform the learners and to make them aware of available tasks and their respective due dates. The front page also contained the learners' groupings according to their stages and was linked to the individual groups' pages. The front page also had some of the learners' photos and was used by the lecturer as a form of ice-breaker to help learners get to know each other.

In Figure 25, an example of the system log can be partially seen. The system log recorded each learner's user ID as well as the activity performed by that user in a sequential timeline. Thus, the researcher could identify whether any particular user ID (learner) was active, how he or she compared to other learners, and who (or whose login) within each group had been more actively involved in updating the page. Whether a new file was created, edited or deleted, and by whom, was also visible from this system log.

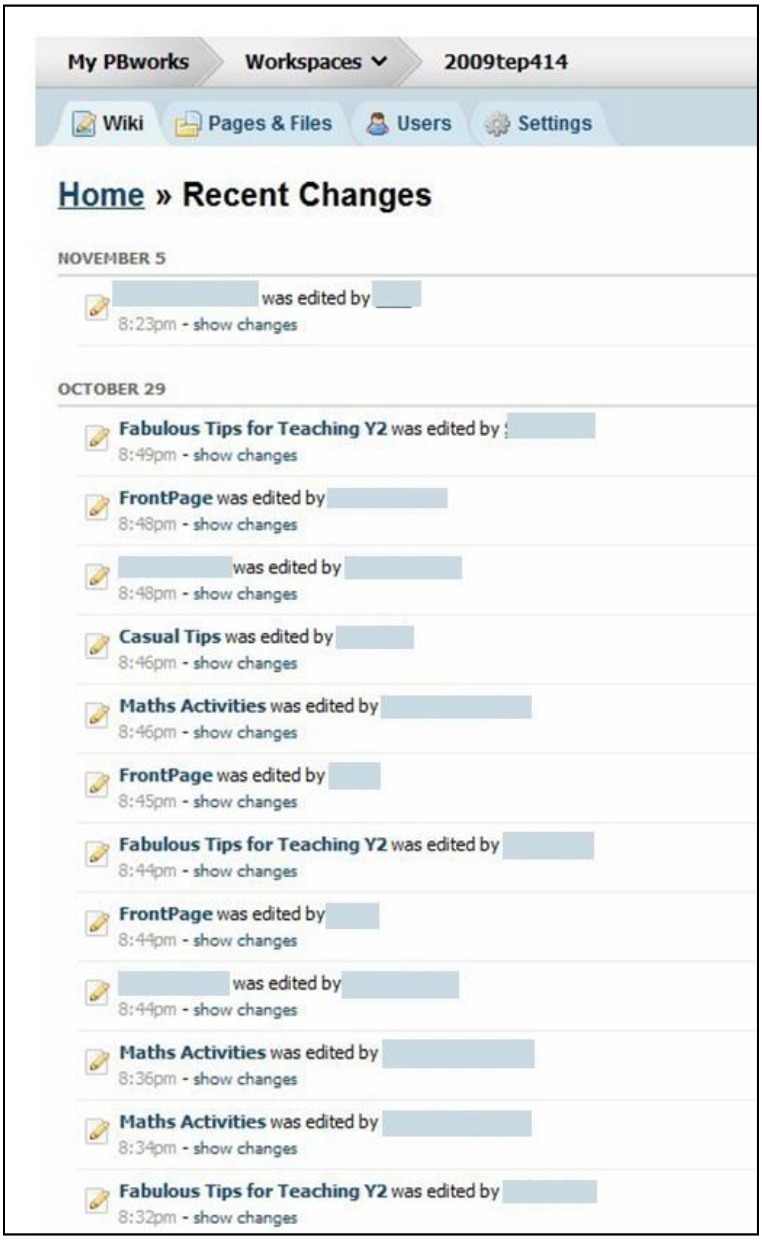
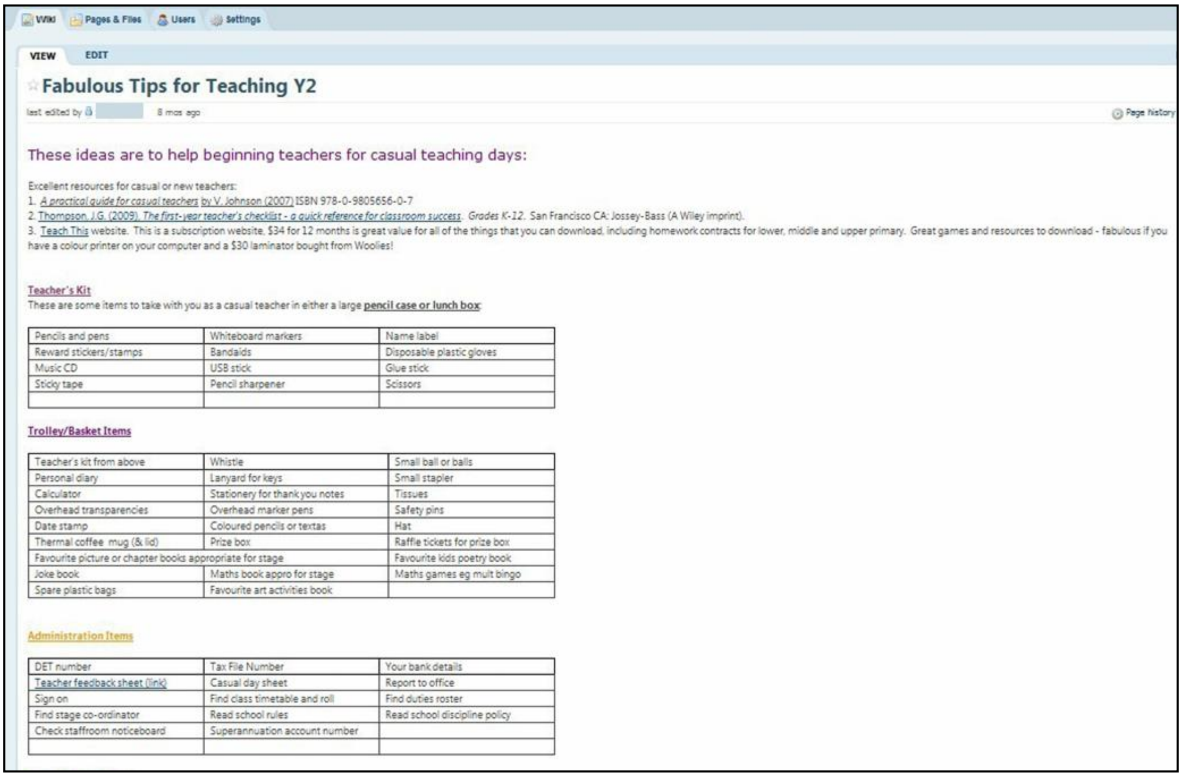


Figure 25 Case 2 - System log

It was observed via the system log that the learners took ownership of practically the whole wiki. Some learners edited and updated the front page by uploading photos and links for general use. This higher level of engagement with the community wiki indicated that he/she had a higher commitment to the whole collaborative activity.

However, the researcher also observed that some users' IDs were never used at all. In some groups, only one of the user IDs was constantly used whenever an update in that group's page occurred. Such observation indicated that the learners in such a group might share user IDs or assign the specific role of wiki updater to a single person. The researcher also found that no single ID dominated the activity in the wiki, indicating that participation was distributed relatively evenly among active user IDs.

One of the artefacts required in the course was a reflection statement or documentation of personal insights which the learners produced as they continued their practice teaching. The screenshots in Figure 26 are examples of such contributions; each one was created by a different learner.



Wiki Pages & Files Users Settings

VIEW EDIT

Fabulous Tips for Teaching Y2

last edited by 8 mos ago Page history

These ideas are to help beginning teachers for casual teaching days:

Excellent resources for casual or new teachers:
1. *A practical guide for casual teachers* by V. Johnson (2007) ISBN 978-0-9805656-0-7
2. Thompson, J.G. (2009). *The first-year teacher's checklist - a quick reference for classroom success*. *Grades K-12*. San Francisco CA: Jossey-Bass (A Wiley imprint).
3. Teach This website. This is a subscription website, $34 for 12 months is great value for all of the things that you can download, including homework contracts for lower, middle and upper primary. Great games and resources to download - fabulous if you have a colour printer on your computer and a $30 laminator bought from Woolies!

Teacher's Kit
These are some items to take with you as a casual teacher in either a large **pencil case or lunch box**:

Pencils and pens	Whiteboard markers	Name label
Reward stickers/stamps	Bandaids	Disposable plastic gloves
Music CD	USB stick	Glue stick
Sticky tape	Pencil sharpener	Scissors

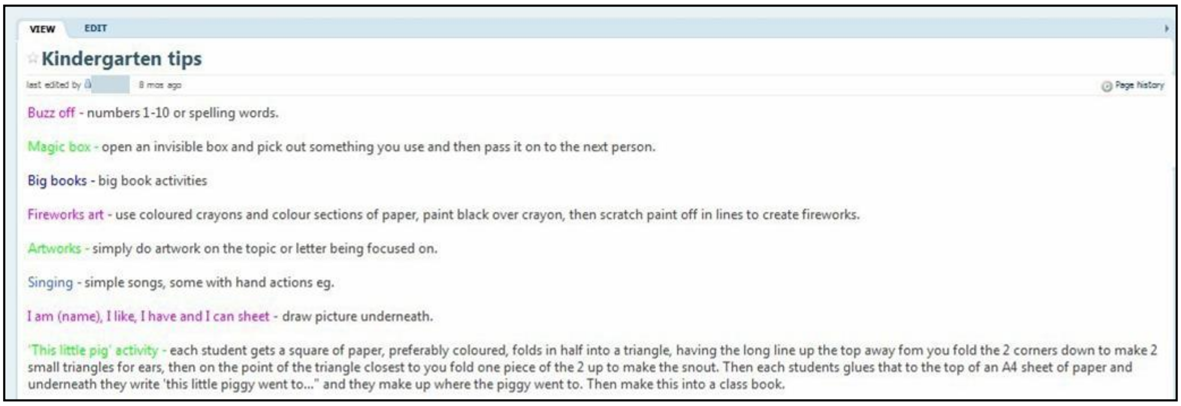
Trolley/Basket Items

Teacher's kit from above	Whistle	Small ball or balls
Personal diary	Lanyard for keys	Small stapler
Calculator	Stationery for thank you notes	Tissues
Overhead transparencies	Overhead marker pens	Safety pins
Date stamp	Coloured pencils or textas	Hat
Thermal coffee mug (& lid)	Prize box	Raffle tickets for prize box
Favourite picture or chapter books appropriate for stage		Favourite kids poetry book
Joke book	Maths book appro for stage	Maths games eg mult bingo
Spare plastic bags	Favourite art activities book	

Administration Items

DET number	Tax File Number	Your bank details
Teacher feedback sheet (link)	Casual day sheet	Report to office
Sign on	Find class timetable and roll	Find duties roster
Find stage co-ordinator	Read school rules	Read school discipline policy
Check staffroom noticeboard	Superannuation account number	

Figure 26 Case 2 - Sharing of reflections (a)



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Kindergarten tips

last edited by 8 mos ago Page history

Buzz off - numbers 1-10 or spelling words.

Magic box - open an invisible box and pick out something you use and then pass it on to the next person.

Big books - big book activities

Fireworks art - use coloured crayons and colour sections of paper, paint black over crayon, then scratch paint off in lines to create fireworks.

Artworks - simply do artwork on the topic or letter being focused on.

Singing - simple songs, some with hand actions eg.

I am (name), I like, I have and I can sheet - draw picture underneath.

'This little pig' activity - each student gets a square of paper, preferably coloured, folds in half into a triangle, having the long line up the top away fom you fold the 2 corners down to make 2 small triangles for ears, then on the point of the triangle closest to you fold one piece of the 2 up to make the snout. Then each students glues that to the top of an A4 sheet of paper and underneath they write 'this little piggy went to..." and they make up where the piggy went to. Then make this into a class book.

Figure 27 Case 2 - Sharing of reflections (b)

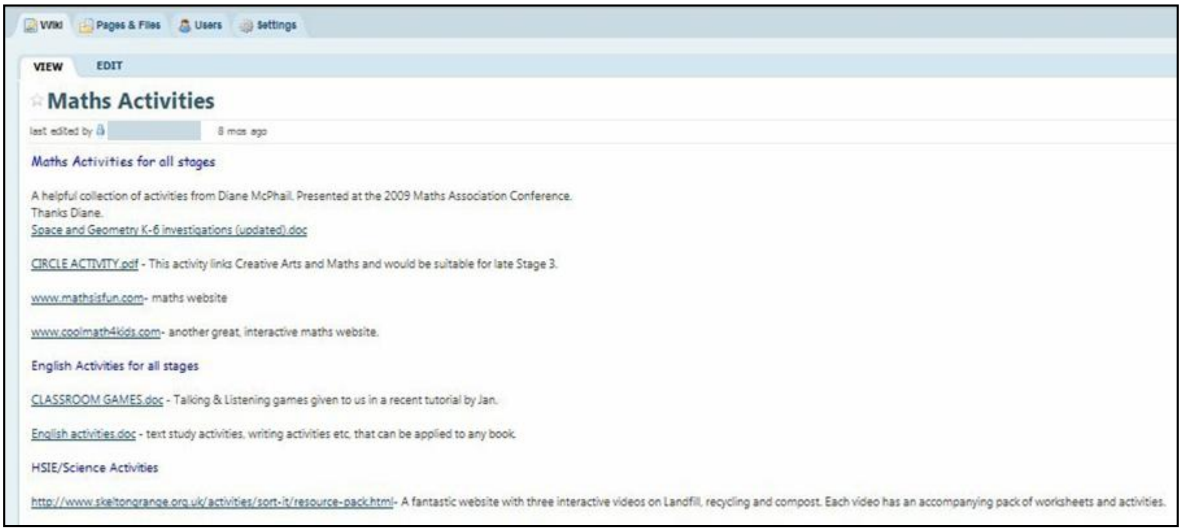


Figure 28 Case 2 - Sharing of reflections (c)

Every learner structured and organised the layout of their contribution in different ways, depending on their personal style and preferences. It was also observed that they created links from their own individual page to others' pages within their group's wiki to make the different pieces of information relevant to each other.

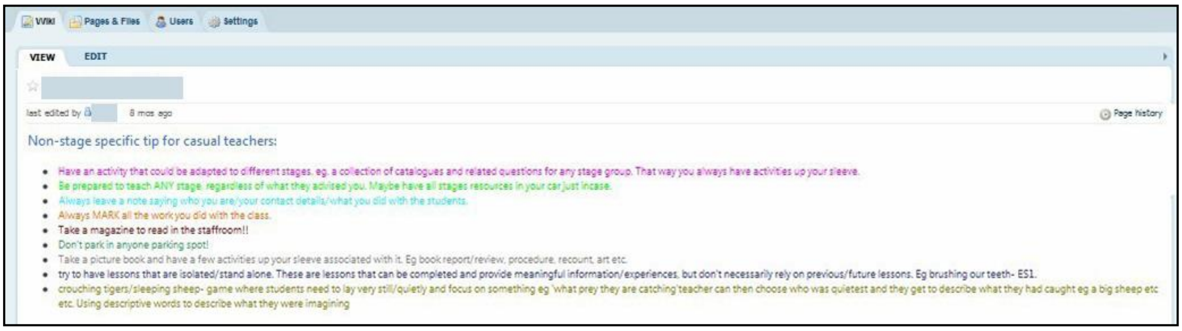


Figure 29 Case 2 - Co-production (a)

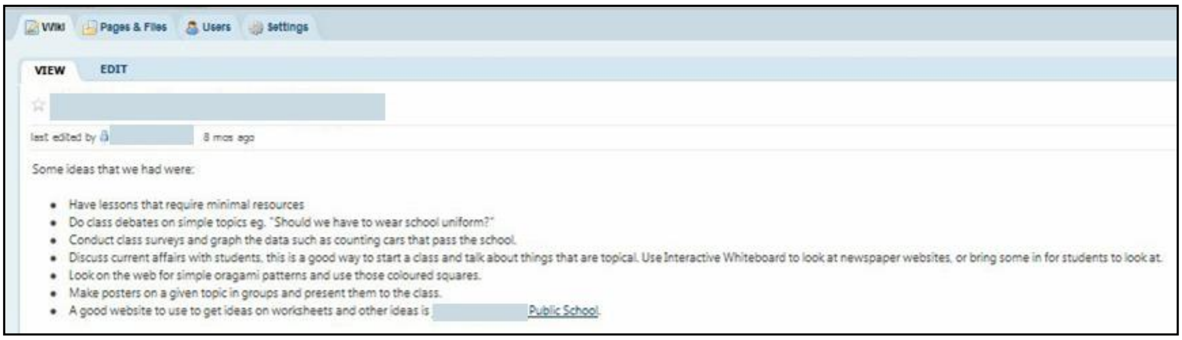


Figure 30 Case 2 - Co-production (b)

The screenshots shown in Figure 30 are examples of co-production. Learners working in small groups created and added content, then edited the same page. Pages were created by one user login and later edited by different user logins, indicating that some form of co-authorship occurred on the page over a period of time. The degree of contribution by each learner could not be determined at this point.

The five screenshots shown in Figure 31, Figure 33 and Figure 35 were responses observed from several groups who responded to tasks 6, 7, and 8 during the tutorial sessions. The lecturer posted the tasks on the wiki and requested that the learners respond with their reflections on classroom management and group work issues. In addition, the learners were asked to share any relevant ICT resources they discovered online which they had used or had considered using in their practice.

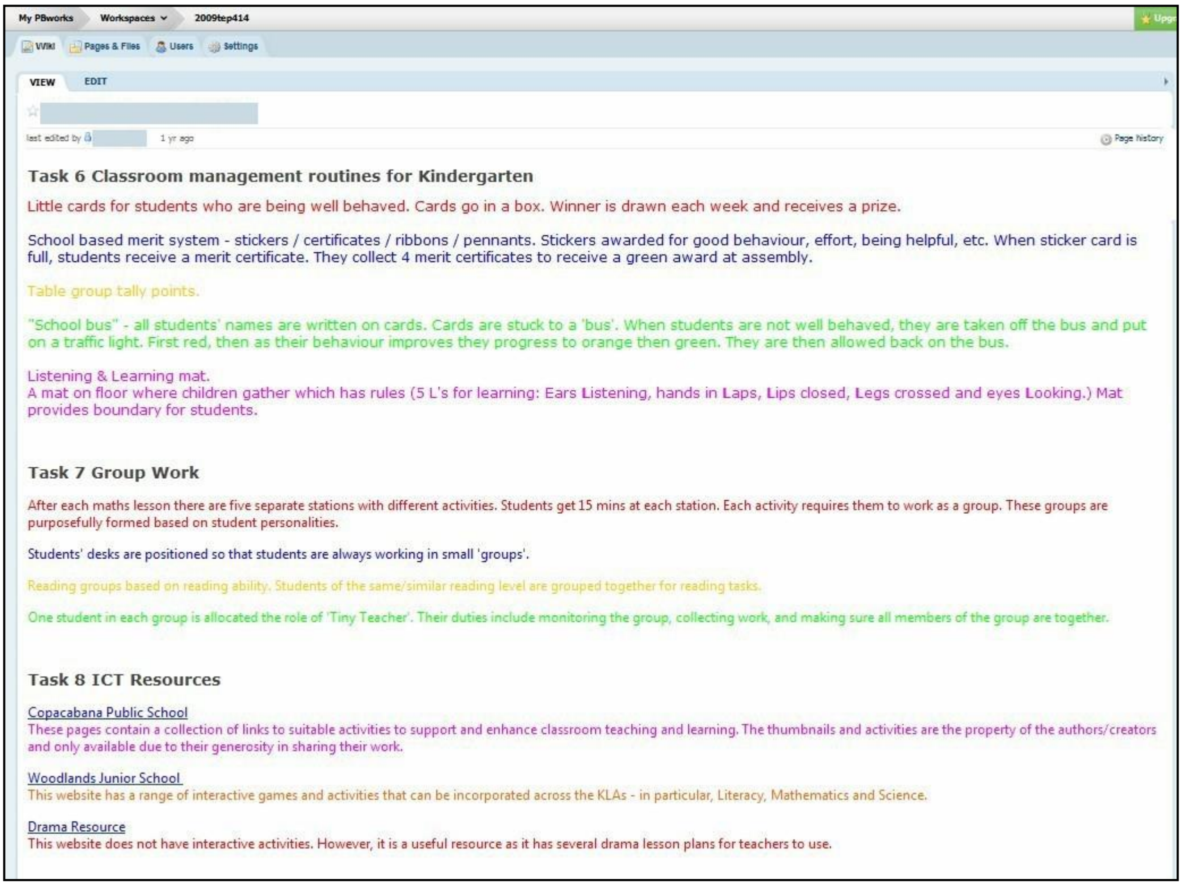


Figure 31 Case 2 - Task 1 (a)

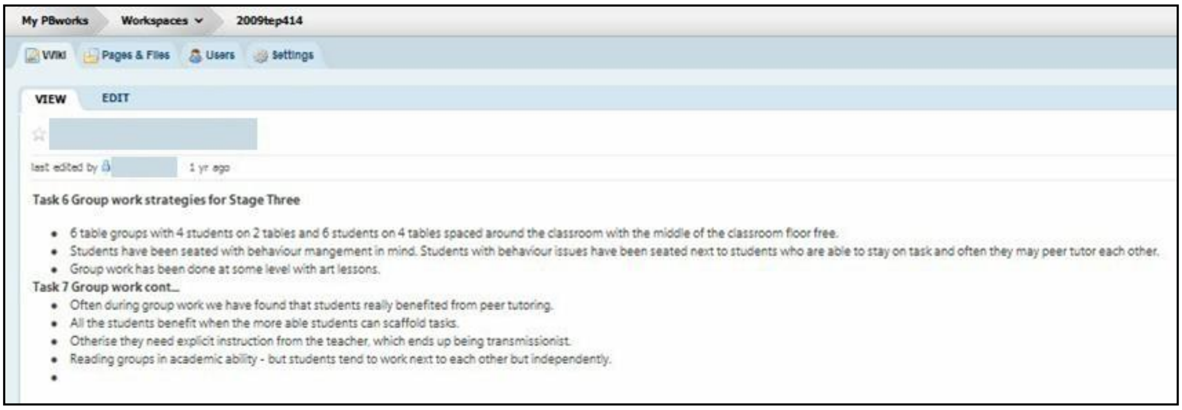


Figure 32 Case 2 - Task 1 (b)

Figure 31 and 32 shows the pages of two different groups; one was a group of three while the other was a group of two. The first contribution was detailed and contained numerous resources with comments about those resources; the other contribution was very simple and arranged the resources in a short bullet list. The artefacts produced in this case demonstrated wide variation in content and form.

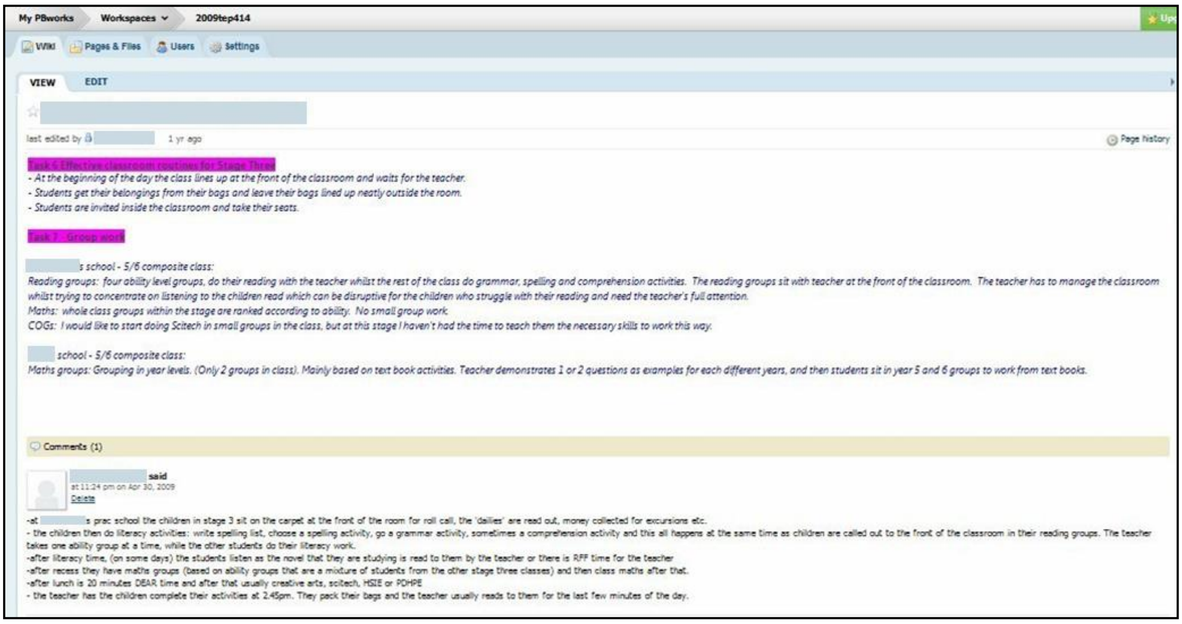
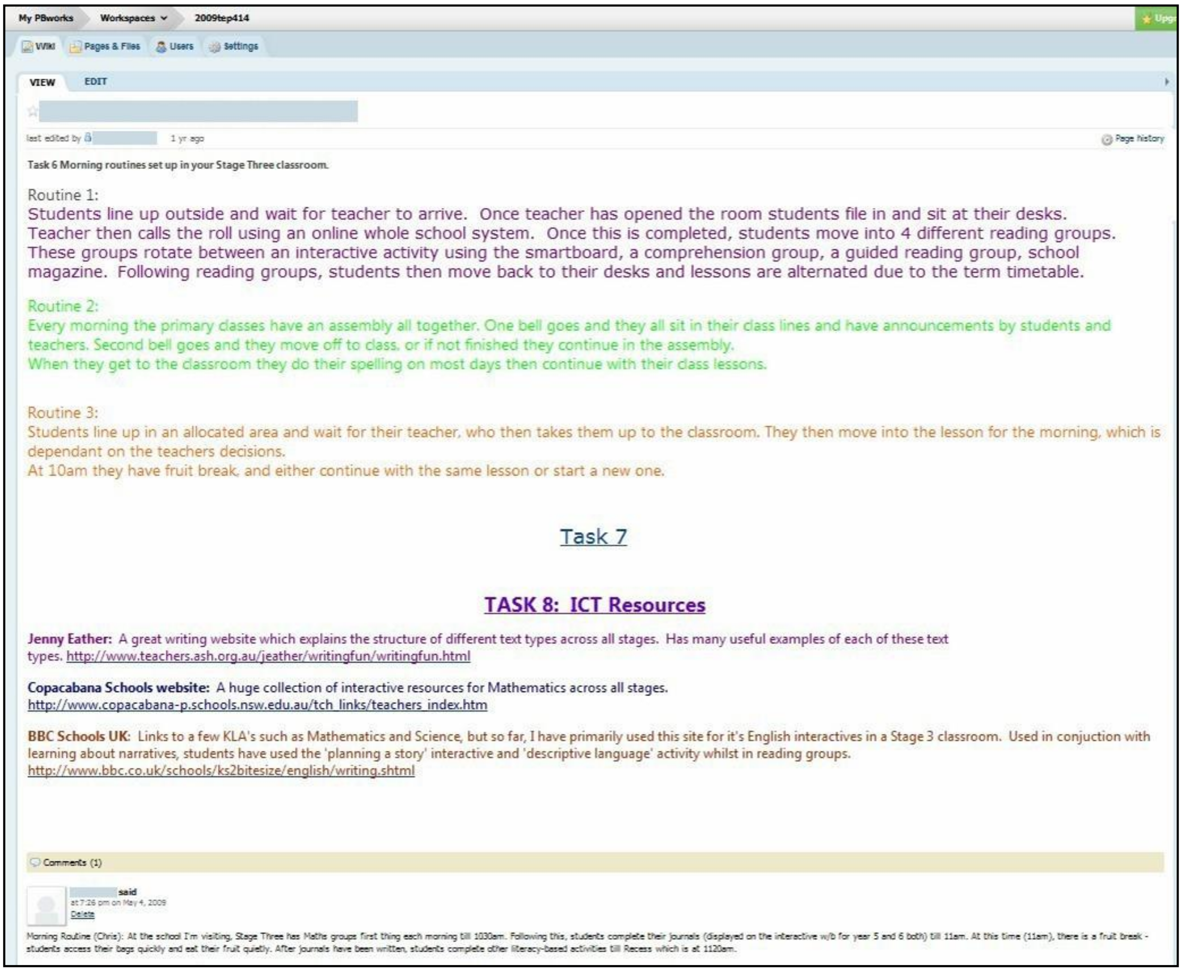


Figure 33 Case 2 - Task 2 (a)


My PBworks | Workspaces | 2009tep414

Wiki | Pages & Files | Users | Settings

VIEW | EDIT

last edited by 1 yr ago — Page history

Task 6 Morning routines set up in your Stage Three classroom.

Routine 1:
Students line up outside and wait for teacher to arrive. Once teacher has opened the room students file in and sit at their desks. Teacher then calls the roll using an online whole school system. Once this is completed, students move into 4 different reading groups. These groups rotate between an interactive activity using the smartboard, a comprehension group, a guided reading group, school magazine. Following reading groups, students then move back to their desks and lessons are alternated due to the term timetable.

Routine 2:
Every morning the primary classes have an assembly all together. One bell goes and they all sit in their class lines and have announcements by students and teachers. Second bell goes and they move off to class. or if not finished they continue in the assembly.
When they get to the classroom they do their spelling on most days then continue with their class lessons.

Routine 3:
Students line up in an allocated area and wait for their teacher, who then takes them up to the classroom. They then move into the lesson for the morning, which is dependant on the teachers decisions.
At 10am they have fruit break, and either continue with the same lesson or start a new one.

Task 7

TASK 8: ICT Resources

Jenny Eather: A great writing website which explains the structure of different text types across all stages. Has many useful examples of each of these text types. http://www.teachers.ash.org.au/jeather/writingfun/writingfun.html

Copacabana Schools website: A huge collection of interactive resources for Mathematics across all stages.
http://www.copacabana-p.schools.nsw.edu.au/tch_links/teachers_index.htm

BBC Schools UK: Links to a few KLA's such as Mathematics and Science, but so far, I have primarily used this site for it's English interactives in a Stage 3 classroom. Used in conjuction with learning about narratives, students have used the 'planning a story' interactive and 'descriptive language' activity whilst in reading groups.
http://www.bbc.co.uk/schools/ks2bitesize/english/writing.shtml

Comments (1)

said
at 7:26 pm on May 4, 2009
Delete

Morning Routine (Chris): At the school I'm visiting, Stage Three has Maths groups first thing each morning till 1030am. Following this, students complete their journals (displayed on the interactive w/b for year 5 and 6 both) till 11am. At this time (11am), there is a fruit break - students access their bags quickly and eat their fruit quietly. After journals have been written, students complete other literacy-based activities till Recess which is at 1120am.

Figure 34 Case 2 - Task 2 (b)

The screenshots in Figure 33 show how a group of three produced the reflection artefact directly on the wiki, as well as how they shared it with others to absorb and respond. One of the members commented on a post following collaboration with another member of the group. Each member then updated the page to add their own response to the task, reflecting on what they had done in their own classroom teaching practice experience.

The screenshot in Figure 334 contains the response from another team on the same task. In this group, different colour coding was assigned to each person's contribution. These contributions included articles and websites they considered useful, in addition to their own personal comments on what was contained in the artefact and how they viewed it as a teaching resource. In this screenshot, a comment made by one of the members can be seen detailing the sequence of the activity that took place in his/her classroom one morning as he/she adopted the suggested activities.

Figure 35 Case 2 - Task 3

Another group's response, depicted in Figure 35, shows the group's effort to construct a hierarchy of pages by making a page listing of the three responses and hyper-linking it to another separate three pages, each responding to a single task.

Summary

In an analysis of the observation data, the researcher found that most learners took ownership of the wiki and started to impart their own expectations on its use by modifying the community pages to be shared across groups. Pockets of co-production also occurred as several groups' pages showed multiple authors' editing activity on a single page.

5.5.3 Semi-structured interview

During the interview one respondent withdrew from the study, concerned about the audio recording done at the interview.

Because students had limited face-to-face time on campus, there was limited time available for interviews. Additionally, on the day when an interview was scheduled, students could not be pulled out of the classroom for too long. The group interviews were therefore conducted with a random selection of two to three students, not necessarily from the same group.

There are a total of 24 students enrolled in the class, not all of them participated in the study. There were 13 participated in the survey, and from those survey participants, a total of eight of students were interviewed.

To discuss the findings from the interview, this chapter summarises the responses and present the summary of one activity system's sub-system at a time (Engeström, 1987):

Production

Learners co-producing outside the tool

Many groups conducted their discussion in the class during the scheduled face-to-face tutorial. One respondent in particular indicated that it was difficult to use the wiki and that some respondents preferred to collaborate through email or by face-to-face interaction when they met in class. They discussed the tasks, presented their suggestions for resources and gave individual reflections to each other. After their discussion, many groups then elected an operator (who usually was the most technologically savvy member of the group) and nominated that person to edit the wiki page for them.

Therefore, although collaboration did occur, and updates on the wiki pages reflected the results of their collaboration, the wiki pages were created by a single person on behalf of the group. Therefore, there was no co-production activity mediated by the tool between learners as contributing producers. The co-production occurred outside the tool and the artefact was created by an off-line activity. Then a designated person, another one of the learners, initiated yet another activity, namely to update the group's wiki to showcase the results of their collaboration to other groups.

Learner reservations about their own product

The main artefacts the groups produced were the various resources (e.g., websites, lesson plans and tips) which they considered relevant to their professional experiences and which could be shared with others. When the learners shared such resources, they did not merely list those resources, they added their personal reflections and notes. Therefore, many learners tended to have some reservation when expressing their opinions to others. They were worried that they and other learners might repeat a mistake by blindly following their (the note originators') personal suggestions and thus be held accountable for that mistake:

> *I don't think (the task was) difficult, was only I suppose the information is from us and we are fallible. So we could be putting up stuff that's really not appropriate. You know, someone might have … and you might use that as gospel, say that that is, oh we read it here and we can do that.*

Consumption

Learners' passive approach when collaborating

The wiki was used mainly to publish and share the produced artefact. However, once it was published, the learners did not take any further initiatives as active co-producers; they did not post comments to the pages made by other learners. Hence, they were passive consumers of an artefact made by someone else. They accepted that the produced artefact was published as it was, and they would personally sort things out later when they were using the wiki. Nor did they criticise the contributions made by others.

Learners described "discussion" between groups as occurring in the form of reading what other groups had posted and then commenting on each other's post. However, some were not engaged with this activity, and commented, "*The thing I didn't like about it was we did - we never - we never discussed it. Like, we were kind of expected to just read through everybody else's in our own time.*" Learners were not excited about having to go through the content themselves in their own time, but they did consider the ability to gain access to a collection of contributions was valuable.

Learners collecting resources for own usage

Despite the reservations they had about their own content, their restraint in commenting on others, and the many instances when the students collaborated face-to-face without any mediation through the wiki, the learners in this case highly praised the way the wiki allowed them to create a large resource between them, organise it and make it available for access anytime from anywhere. The ability to share and access the resources was the predominant reason for their taking part, doing so for their own sake while enabling others to benefit at the same time.

> *I think for me it's just been, it's good to have all of those resources that everyone is collecting in the one place. Some of them have tried to load them up on to like Blackboard or some of our other communication systems. but it is much harder to find things again.*
>
> *I guess wiki was more for us to use to provide information for the other students in our class, and use it as a way to - not just for now, but something that we can always go back to.*

They also reflected on the possibility of using the wiki in a similar fashion within their own teaching practice. They realised the benefits of the wiki as a 'share and storage facility', and the same affordances were mentioned in their reflections on how they could be applied in their own classroom. Some learners also pondered on the possibility of conducting a collaboration activity in their classroom which could be even more meaningful:

> *It got you thinking about how you could do - from a classroom sense - how you could set up something like that in the classroom, and having your students working on different activities, and then you - able to collaborate that all together, bring it all together and then it's all on one thing for everyone to see. It makes it a lot easier to see everyone else's views and ways that people work on things differently.*

Communication

In this case, the communication between members was conducted mostly face-to-face when they met in the one classroom on campus. They effectively had four to six weeks out of the available 13 weeks in a semester to meet and work on the wiki in this way.

There was not a great deal of collaboration conducted outside the classroom as each learner claimed they did not have enough time to do so, or they perceived the task as not requiring too much comment on each other's work. Nonetheless, students did express their awareness that they could continue their discussion through the wiki from anywhere. *"You were meant to do it outside. Yeah, because by the time you wrote your own group's thing, the class time was pretty much up."*

Learners also mentioned not having sufficient time to read each other's posts out of class as a primary reason for not collaborating through the tool outside that scheduled tutorial time.

> *You can show them that you can put your own comments there, you can talk amongst everyone on the wiki about the different things that you've been doing, and use it as a way to communicate apart from just face-to-face communication.*
>
> *We weren't really encouraged to comment on other people's things. Maybe once we leave and we have actually tried the ideas, then we might be able to put comments up there and I am not sure if the comments are open to everybody or if it is just <teacher> at the moment is able to do that. I don't know.*

Distribution

In this particular case, the distribution of work was not apparent at all. This was because the group worked in unison; no single task given to a single person to make him or her unique in relation to the other group members. In addition, the students pursued the task as much for their own intrinsic motives.

5.5.4 Integrated discussion

Henceforth, the term 'student' is used to refer to the participants of this case study.

Students' familiarity with the tool

Because a questionnaire was conducted at the beginning of the case study and the interviews were conducted towards the end, the researcher had the opportunity to interact twice with the interview respondents, and was able to notice changes in their attitudes towards using the tool. One respondent in particular, who at the start of the study considered the wiki to be a difficult tool, changed his or her opinion to express during the interview a high level of confidence in using the tool. Others expressed a range of similar changes in their attitude.

Unfamiliarity was a significant factor that contributed to students' initial negative attitude towards the tool, as they were initially sceptical and uncertain about its use:

> *So I think, probably most of us, it was a whole new concept and I don't think we really even fully understood i.e. think this time I've understood it better and even <colleague's name> has used it in science as well ... And we've sort of got even better again and I do understand the concept, even better than when I think we did the questionnaire.*
>
> *You get over that, what do I do, each step, point, and then you are able to actually use it properly. Whereas, initially it was just like, oh, how do I actually even edit a page or how do I add a new page or how do I do that?*

The increase in students' confidence in using the tool corresponded to the increase of wiki usage inside and outside formal scheduled study hours. Students stated that once they gained enough confidence to use the tool, they would use it outside the classroom when they had more time to explore its uses further. Thus, once a certain level of familiarity was reached, it was easier and more likely for learners to independently explore the tool and increase their use and mastery of it:

Maybe they might have been more familiar, but I think for us it was really each - we only probably started it only half way through even the semester, it wasn't even the whole semester. So I felt just slowly, but now, just, yeah, being able to edit the page is good, being able to find... other, yeah, uploading files from home, actually doing it, so I did a lot more at home on some of the other, the later ones, than I've done ever – we didn't do anything at home on the other because I suppose we just didn't understand it

Students' familiarity with the interface

Part of the familiarity that the students needed was familiarity with the interface. This highlighted the need for the teacher to provide basic training and to allow experiences to build from the ground up to help learners get familiar with the interfaces (e.g., what each icon means and where to locate it). This case study showed that in addition to the majority of the learners being new to the use of wiki, some had to overcome exceptional difficulties to get used to navigating their way around it. However, by the end of the case study, the students who participated in the study displayed a higher level of confidence in using the wiki to satisfy their collaboration needs.

Students' access to the tool

The difficulties students experienced in accessing the wiki prevented them from attempting to use it on their own outside the classroom schedule. They acknowledged that they needed more time to familiarise themselves with the access process, the technical features of the wiki and the application of the wiki within their learning context. Those who had prior experience from other units in using the wiki benefited from the experience as they became more accustomed to the interface and were able to use it better both technically and within the context of their learning.

I would have liked to have done this if we had longer lessons because I think that an hour is a long time to get - is not a long time to get a grasp on - because you're learning and doing at the same time.

Waiting to log in or waiting to do something and then by the time <teacher> came around it was like, it's 5 to, let's go, see you later. Like a lot of people didn't even write anything because by the time they got through the technical difficulties it was - the lesson was a waste, yeah.

Student's perception of the task and their perceived affordance of the tool

Students considered that they needed to collaborate only in the tutorial; a perception that undermined the lecturer's attempt to promote collaboration outside the classroom. The respondents therefore focused their efforts on using the wiki as a publishing tool, with the single purpose of representing the group and expressing the group's outcome of their collaboration.

Students did not perceive that there was any expectation or urgency to collaborate other than in the classroom. As they did not see the need for such asynchronous communication through the wiki, they were not compelled to explore the wiki to support their communication needs.

Students reluctant to edit others' contribution

When the group published their collaboration output on the wiki, in the majority of instances it was done with no regard for the need to give credit to each individual contributor. Although a few groups adopted a colouring scheme to mark individual contributions, in general there seemed to be little desire to acknowledge individual contributions.

When looking at this phenomenon by itself, it could indicate a preference or style; however, in this case study, a contradiction was observed. The learners, who collectively preferred anonymity, were reluctant to make changes or edits to an entry posted by others because they considered others' contributions valuable. However, the anonymity may have provided a conducive environment for active collaboration precisely because each contribution was not directly assigned to an author and it was less likely for any member of the group to feel 'attacked' by comments or edits from other members.

Students' expectation of inter-group interaction

Some students expressed less enthusiasm about collaborating between groups because they felt that there was little time for discussion to critique other groups' works. It is to be noted that inter-group discussions were expected to be carried out by the learners independently through the wiki.

This was in contrast with the in-group discussions where learners conducted face-to-face discussions directly with their group during their scheduled tutorials. The synchronous verbal interaction appealed to them more than asynchronous collaboration.

In regard to commenting on each other's work on the wiki and via the wiki, many considered that they did not have enough time to read through the many posts and to make comment on them because it was a slower asynchronous or self-paced interaction. They preferred a presentation-like format where the presentation and comments could be done in a synchronous dialogue.

To understand the cause of this preference was beyond the scope of this study; however, the learners' collective preference for verbal synchronous communication added to their tendency towards passive consumption of artefacts. Moreover, the lack of motivation for co-production prevented the learners from taking advantage of the tool to mediate a deeper collaboration.

Students' perceptions of sharing vs communicating

The ability to upload artefacts online for personal and group viewing or, in short, the ability to *share*, was the most dominant affordance perceived by students in this case study.

> *"You can go to a place and get ideas from other people, so it's just that sharing tool."*
>
> *"Yeah, I've been a part of a few other wikis for different reasons. I think they really need to serve a purpose, which I think this one does do.."*

The perception that what was stored in the wiki would then constantly be available to them forever and *location-independence* – that it could be accessed from anywhere – were also dominant factors shaping the respondents' perceptions about the wiki. Many perceived the wiki as the perfect "eternal" place to put and organise resources that might otherwise be forgotten or lost if they had recorded them manually.

The students held no strong perception regarding the use of the wiki as a medium for communication. Only 25% of the respondents acknowledged the existence of such a feature, and none actually used the feature to communicate. They perceived the feature only as means to annotating a post.

For these sharing affordances to be used, there were several factors that would determine whether or not they were taken up by the student: the perceived relevance of the content, as one respondent put it: "*So I guess it was content rather than the service*"; and familiarity with the tool, as one mentioned: "*... and I guess now, because we know how to use it.*"

> *When I was on one of my pracs, the classroom that I was working with was very involved in creating their class wiki and they'd submit homework through it. I had to become involved for my own teaching and learning purposes, so I was submitting pages of riddles, and they'd have their own personal pages. It just became a tool there, so I became familiar with it in that process of the class - as in a primary school class - collaboration effort. It was good. It was good in that sense, as well.*
>
> *Yeah, definitely sharing resources. Like - because we were at a computer it was really easy to go to all the websites that we found helpful. So we used to just go, I saw this one and type it in and everyone would go, that's really cool, so then we'd link it and just things like that. So it was easy to share resources that way and also with sharing just ideas. Like I saw this happen, I saw this happen, if you go to this book. You know that sort of thing. It was - we talked a lot about that kind of stuff and then most of that got put on (the wiki).*

Students value the content highly

Students strongly valued the efforts made collectively in their group to produce quality content that was relevant to their professional development. Because the resources shared in the wiki were not merely a list of links, they were enriched by their own thoughts and opinions and those of their peers. As a result, the resources became much more relevant to them:

"I think the best bit about it was the resource. So it was valuable for that, for sharing resources and the one that we did with the lesson ideas. We did one that we wrote out some science experiments that we'd done with our classes, which we'd done for a previous assignment. So that was really valuable because it gave you some lesson ideas with things that other people had already tried."

"If you have half an hour where you can flick through everyone's page and see everything that they've written and summarised, it's just so easy. Like, you get such a scope in relatively short amount of time. So that's the biggest power to it, I think for me."

"Yeah and maybe like when I start teaching and I need lesson ideas and things like that I'll use it but at the moment I'm not teaching, I've finished my prac. So I've got assignments and housework and washing and stuff to do. Like, I'm - I'm not going to sit there and be like, let's read through everybody else's ideas. Like right now it's not a valuable tool for me but in the future it probably will be great."

The wiki was gradually perceived as being able to hold information that each learner considered could be used at a later point in time. This view enforced their positive perceptions of using the tool as a sharing instrument; at the same time, it focused their perception of being able to publish artefacts. However, such focus also limited their opportunities to perceive other affordances of the wiki.

Students' extension of their collaboration experience

The study showed that the students, who were all pre-service teachers, were able to express their enthusiasm in deploying technologies in their future practice. Thus, the inspiration created by their own personal experience could become a strong advocate for future technology adoption. Therefore, the more pre-service teachers can perceive and experience the various affordances of a Web 2.0 tool, the more likely it is that they will adopt the technology in their teaching.

Although pre-service teachers might have had the intention to apply the technology in their own classrooms and were open to innovation, they needed to use and experience the technology before they could be expected to incorporate it into their teaching practices. Thus, it is crucial for pre-service teachers to experience as many affordances of the technology as possible, which could be done by infusing technology into pre-service education courses. Such an approach needs to be seen as a long process of continuous experience-building rather than a one-off or a feature of a single unit. The pre-service teacher would benefit greatly if the technology experience was to permeate throughout the course, forming cycles of opportunity to acquire familiarity with the affordances.

Pre-service teachers may eventually realise the need to use technology when they become involved in professional experiences at school, as some of the respondents in this case study testified. For some, it was in response to the demand to use the tool while they were undergoing their practice teaching that they felt pressured to get used to the tool quickly and become comfortable with it. However, because practical experience in the formal teacher education programs is usually undertaken later in the semester rather than earlier, it may be beneficial to introduce the technology to pre-service teachers at an earlier point in the course. Not only would they become more familiar and comfortable with it, earlier exposure to various affordances of technology in learning may promote a more creative and innovative approach to their teaching practices. However, further research needs to be conducted to substantiate this claim.

Mismatch of affordances

The affordance to use the tool as a sharing facility was clearly perceived and utilised in this case; however, it should also be noted that the scaffold for the sharing activity established by the lecturer played a considerable role in sustaining this affordance. Kirkwood (2009) asserted that students would pursue the tasks given in a manner which corresponded to what they perceived to be the intention of the task. Therefore, the way the sharing tasks were scaffolded influenced the way the sharing activities were carried out.

> *Yeah, but that's probably, I mean, that's all we've used it for. You know, we haven't really used it as a communication tool or anything. It's really been a storage really, hasn't it? (Why is that?) I don't know. I don't think we've really – I think <teacher> has wanted us just to provide information from this, in this setting.*

Learners did not do literally what was stated in the unit outline and they did not just follow the instructions given by the teachers. Rather, the learners received and perceived those instructions, and the outcome of their perceptions determined their effort and their course of action. Therefore, reinforcement from the teacher was needed from time to time to promote the appropriate perception regarding what the tool could support them to do and the way in which it corresponded to the tasks' needs.

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6 Case Study 3: Wiki to support science pedagogy

6.1 Introduction

This chapter is structured firstly to give the relevant background literature, then explain the collaborative task, contextualise the research methodology and, finally, discuss the findings.

The third case study was conducted with two consecutive third-year units during 2009. The units were part of a four-year Bachelor of Arts, Diploma of Education program coordinated in the Department of Education at a city-based university. The two units were TEP290 and TEP291: "Curriculum and Teaching in the Primary School II" and "Curriculum and Teaching in the Primary School III" respectively. The units were positioned to prepare primary teachers with the knowledge and competencies required for teaching science at primary-student level. The units discussed six Key Learning Areas (KLAs) as well as teaching/learning strategies and approaches.

There were 152 pre-service teachers enrolled in these units, divided into six tutorial classes. This study covered all of the tutorial classes. The units had a five-hour-per-week schedule, allocated in the form of an in-campus lecture and tutorials. During the tutorial sessions, the pre-service teachers would meet with their peers to work collaboratively on assignments. The activities in the wiki were part of the class-work for each tutorial and were not used for formal assessment.

6.2 Science pedagogy

Science teacher challenges

Innovation in curriculum design has historically been a consistent and strong factor in pushing science education reform, which in turn has directly impacted on the students' and teachers' daily classroom activities (Brown and Edelson, 2003; Forbes and Davis, 2007). With the advent of social media and socially-motivated web-based technologies, there is even stronger motivation for science teachers to incorporate these technologies into their teaching and learning activities. Various publications characterise successful and effective science teaching through the teacher's ability to exploit ICT in a multi-modal representation of their teaching (Groundwater-Smith, Ewing, & Le Cornu, 2011; Hackling, Peers, & Prain, 2007; Tytler, Cripps-Clarke, & Darby, 2011).

Another challenge for primary science teaching is that most pre-service primary teachers do not have the confidence to teach science (Appleton, 2006; Fitzgerald, Dawson, & Hackling, 2009; Tytler, 2007), and so science subjects are often not taught properly to primary school students.

A context of apparent unwillingness on the part of pre-service teachers to teach science compounds the challenge of using new technologies However, we know from Adrian Kirkwood's (2009) research that the teacher is a strong agent of influence who can have a significant impact on practical innovations in schools and influencing how students learn. Thus, gaining experience with technology within the context of teaching and learning are crucial for pre-service teachers to promote the use of new tools to students.

Pre-service science teachers, in fact all teachers throughout the developed world, are facing the same challenges in their teaching; they have to cope with large amounts of content (e.g., science content, science process) and become somewhat of an expert in the subject matter so as to be able to model scientific inquiry in their teaching practice.

Complexity of teaching with technology

Teachers need to operate and utilise technologies as well as inspire their utilisation in their classes as the technologies become more mobile, pervasive, widely available and integral to their students' lives (Chai, Ling Koh, Tsai, & Lee Wee Tan, 2011; Forbes and Davis, 2007; Jimoyiannis, 2010; Zhanga, Looia, Seowa, Chiaa, Wonga, Chena, Soa, Solowayb, & Norrisc, 2010). Therefore, a framework is needed to make explicit to pre-service teachers the complexities associated with the use of technology in the classroom.

Mishra and Koehler (2006) conceptualised TPACK (see Figure 36), which is a framework that classifies the different types of knowledge an individual teacher must have to teach with technology. Expertise in these knowledge areas is crucial for effective integration of technology into classroom teaching (Chai, Koh, Tsai, & Lee, 2011; Cox and Graham, 2009; Mishra and Koehler, 2006). Therefore, in this case study, the lecturer sought to afford the pre-service teachers the opportunity to construct their technology-enriched science pedagogy. The tasks were relevant to all seven constructs of TPACK (Chai et al., 2011), which were:

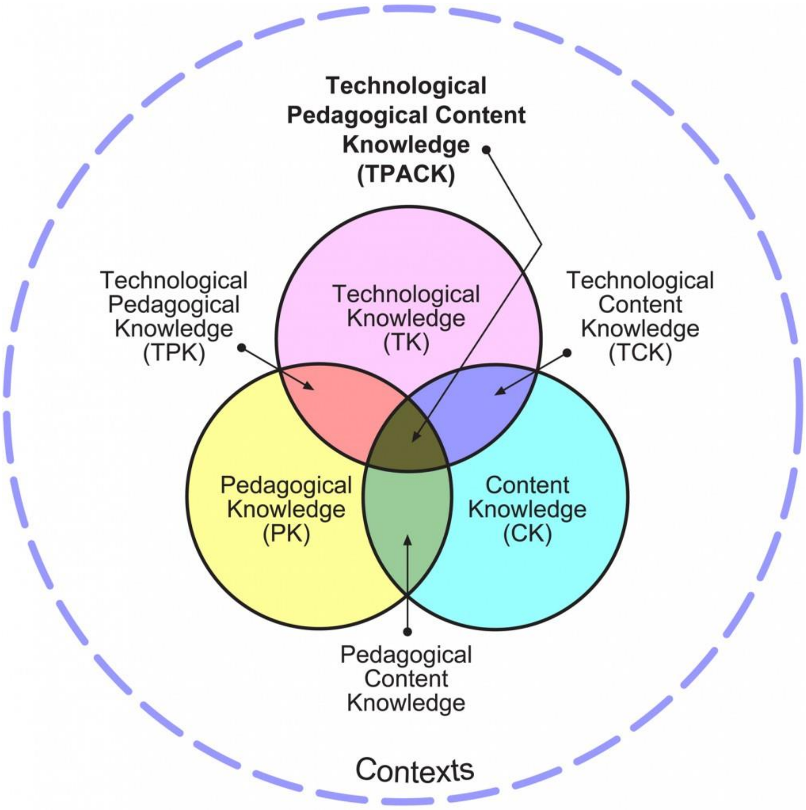


Figure 36 Technological pedagogical & content knowledge (TPACK), (Mishra and Koehler, 2006, p. 1025)

As part of the process, the pre-service teachers had to:

- become familiar with operating the wiki as one of the tools readily available online and considered useful for promoting collaboration amongst students (*Technological Knowledge - TK*)

- plan the instruction in detail, deliver the lessons and manage students in relation to a particular topic (*Pedagogical Knowledge - PK*)

- develop their own expertise in the particular subject matter of interested related to science (*Content Knowledge - CK*). This was promoted through collaborative practices with their peers.

- Show other pre-service teachers as well as students how the content could be researched and presented via the use of technology (*Technological Content Knowledge - TCK*)

- make the use of the technology comprehensible to their (school) students (*Pedagogical Content Knowledge - PCK*)

- consider how to use the technology to facilitate their pedagogical approach (*Technological Pedagogical Knowledge - TPK*)

- know how to facilitate students' learning of specific content through appropriate pedagogy and technology (*TPACK*)

In a study in Canada by Goodnough, Osmond, Dibbon, Glassman, and Stevens (2009), pre-service teachers testified that they experienced a lot of advantages through peer collaboration. They claimed that they could learn from each other and thus enhance the quality of their teaching as well as broaden their understanding of what did and did not work. Respondents in the study also claimed that they became better equipped to work collaboratively with other professionals. This is an important skill to have as a professional teacher, as mentioned by the former Australian Minister for School Education, Peter Garrett, at the National Conversation with Principals 2011 in Canberra (http://www.deewr.gov.au).

6.3 Learning tasks

In this particular case, the lecturer intuitively embedded TPACK into the pre-service teachers' activities. This was accomplished through a step-by-step building process on a specific lesson plan about science topics. This was conducted at the same time as the pre-service teachers were developing their own expertise in utilising technology, designing pedagogy and gathering content.

In TPACK, there is several technologies that could be involved in the teaching/learning process; there were technologies to help teachers to present the content (Technological Content Knowledge/TCK) and technologies to support the way teachers deliver the content (Technological Pedagogical Knowledge/TPK).

When reflecting on the technology for this case, the respondents were asked to refer specifically to the wiki and its various roles in the teaching/learning process.

Although the use of the wiki was mandatory, it was not stipulated how it should be used as a platform for students to construct their science lesson plan. Rather, the requirements were for the lesson plan to reflect their pedagogical approach in teaching science on a topic of their own choice. They could use any resource available freely online that they thought was relevant to their needs. Nor did the teacher of this unit mandate how the group should use the wiki; this allowed the group to take ownership of their section of the wiki and develop it in ways suitable to their own needs.

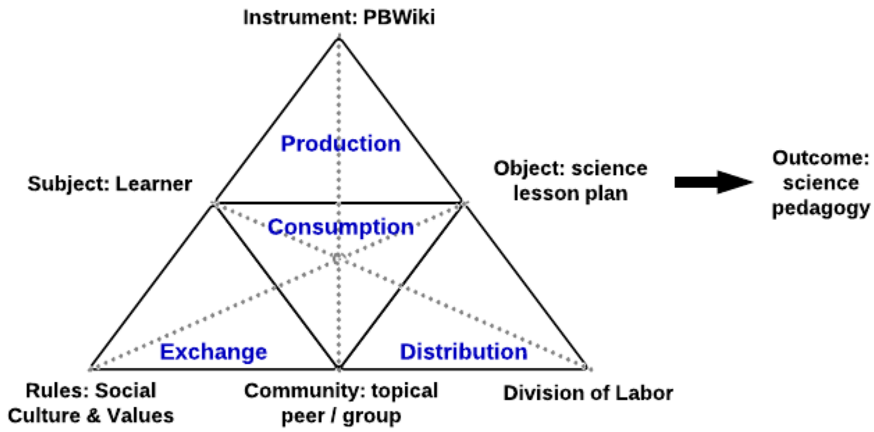


Figure 37 Activity system as framework for analysis of Case 3

In a summary of this particular case, activity theory was used to guide the research itself, as a lens through which to look into the collaboration mediated by the wiki. The framework itself was previously explained in Figure 17 and the explanation here is intended to contextualise it within Case Study 3 (Figure 37).

As mentioned earlier, there were two types of tools used in this case study. One type was the wiki where collaboration took place amongst members of a group, as well as between groups. This tool was the main focus of this case study and the participants were asked in their questionnaire and interview to reflect on its use (unless specified otherwise). The other type were the content-specific tools that the students selected to deliver the content, such as YouTube for video content, or Shockwave Flesh for animations. These tools, however, were not used for collaboration.

The collaborative learning activity in this case study was observed at the level that corresponded to the learning objective of the unit. Specifically, this was to produce a good understanding of science pedagogy and to be able to use suitable technology appropriately to enrich their students' learning experience. Both of these out comes could then be encapsulated within a sound and specific science lesson plan that was properly designed with sufficient detail. Furthermore, Goodnough, Osmond, Dibbon, Glassman, & Stevens (2009) maintained that the process of design should be conducted as a collaboration among equal peers who had an equal interest in the topic they were working on in order to learn from each other,.

Table 15 shows the classification made by the lecturer as well as the topic titles the students pursued in the unit at the time this case study was conducted.

The actor in this activity was the individual pre-service teacher students; and their peers were other pre-service teacher students who worked in the same group and share the same topic of interest. Because each topic was different in scope, depth and difficulty, different strategies and resources needed to be collected by the group for them to deliver the content successfully to primary school students.

The lecturer set down a few basic rules to manage the communication between groups, as well as within each group. Administrator rights to the wiki were reserved for the lecturer, while participants were given the editor privilege, which allowed them to create and edit resources within the wiki. Because the group members were to produce a single lesson collaboratively, there was a division of labour in this case study. The dynamics within each group in relation to how they organised the workload and negotiated the TPACK in their science pedagogy were left to the groups to manage.

Table 15 Title of science lesson plans

Classification	Title(s)
Animals	Butterflies; Silkworms; Animals and their eating habits
Chemical Reactions	Oil and water; Chemical reactions; Liquid and solids; Gak (Non-Newtonian Fluid)
Cars	Cars
Conservation	Conservation; Water Catchment
Dinosaurs	Dinosaurs
Electricity	Electricity
Food	Food; Growing Food
Human Body	The human body; Model of digestive system; Body parts; Organs; Human skeleton; Movement and exercise; Circulatory System; Athletic movements; The senses; Systems of the Body; Impacts of exercise on the heart; The human respiratory system
Biodiversity	Insects in Sydney; Plants and Animal of Mars Creek; Long Reef
Life Cycles	Lifecycles of tadpoles; The life cycle of a frog; Animal life cycle
NRL	Nutrition and NRL
Natural Disasters	Tsunami; Volcanoes; Earthquakes; Tornadoes
Fossils	Fossils
Oceans	Oceans and Seas; Waves; Sea Mammals; Sharks

6.4 Methodology

The methodology used in this case study was explained in Chapter 3, and the methodology section in this chapter is designed to contextualise the previous methodology chapter within the context of this particular case study. As previously pointed out, the study used activity theory as a framework to guide the study as well as serve as the analysis lens through which the collaborative learning activity was observed.

6.4.1 Aim

The aim of this case study was to examine:

- what affordances the wiki offered students undertaking collaborative learning tasks
- what learning discourses these affordances supported
- how students perceived those affordances and used them in their collaborative learning activity
- what influence academics had in this process.

6.4.2 Data collection

The collection of data in this case study included observation of the wiki through system logs and sighting of the wiki pages, an online questionnaire and a semi-structured interview. The observation was carried out over two semesters, covering two consecutive units. By observing the wiki pages, the researcher was able to see how the wiki was used by the group. Even though the system log revealed what kind of activity each individual team member had undertaken on a particular page, it was not possible to determine precisely what editing had been performed by each individual. Therefore, each team member was not observed individually; rather observation of the group was conducted.

All teams were observed, and although the students were made aware of the existence of the study, the observation period was not announced to them in order to minimise any alteration in their collaborative behaviour.

The questionnaire was conducted online and administered close to the beginning of the first semester. Each student who consented to participate in the study received an official invitation via email. Each respondent was identified by name so that each individual's responses could be compared with their interview results. Participant responses were, however, coded to ensure their anonymity. A semi-structured interview was undertaken towards the end of the second semester.

6.4.3 Procedure

There were 152 students enrolled in the class at the time the study was conducted in 2009. Of these, 33 participated in the questionnaire, but five did not complete the questionnaire properly. Thus, only 28 participants (18%) were counted in the study and nine of these voluntarily took part in the interview.

At the beginning of the semester, students were asked to nominate their own area of content interest related to science. Each prepared a 200-word explanation on the selected research topic. The choices included topics related to biology, physics and sport. The lecturer explained that from experience and many years of observation, many primary science teachers became science teachers out of necessity rather than any individual passion to teach science. Moreover, he claimed that some even disliked the subject. Therefore, the first step was to engage students in science through relevant everyday topics about which they were already passionate.

The topics selected by the students were very diverse. A majority of them who enrolled in the units were interested in biology topics, such as the human body, muscles or sport. Other popular topics were about the universe, volcanoes and other natural phenomena. There were also no restrictions on how wide or narrow the scope could be. One particular topic observed in this case looked specifically into non-Newtonian fluid properties. The complete list of topics selected by the students in the semester when the study was conducted is listed in Table 15.

The lecturer put the students according to their nominated topics into groups of two to three. As a result, more than one group worked on the same topic, depending on the popularity of the topic. Although they were given the freedom to select their own topics, the grouping was decided by the lecturer through random selection.

Once the students were in their groups, they were given a starting page in the wiki. Each group had its own wiki page which the group members could freely expand, add pages to and arrange in any way they chose. They were given equal privileges as editors of the wiki, which was the free version of PBWiki (https://my.pbworks.com/).

At the beginning of the first semester, the lecturer demonstrated to the students the capability and features of the wiki and conducted a small introductory workshop. This allowed the students to become familiar with the wiki format and obtain hands-on experience.

The lecturer scaffolded the weekly tasks, starting with such basic wiki skills as navigation, setting passwords and access, before gradually increasing the level of difficulty into tasks that required greater familiarity and skill, such as making pages and attaching files, links or any other multimedia resources.

During the next stage, the attention shifted both to *Content Knowledge* (CK) of the topic they selected and the *Pedagogical Knowledge* (PK), or teaching/learning strategy. In this case, the lecturer proposed early in the semester that the wiki was to be a place where resources could be placed and where lesson plans could be created and discussed. The lecturer did remark that the emphasis would be more on using the wiki as a shared workspace rather than as a space for dialogue, although the lecturer continuously encouraged students to comment on each other's work.

To capture the data, this study deployed several instruments, as shown in Figure 18 Research design. Document analysis was the first step to be carried out at the start of the first semester to identify the schedule and to understand the learning tasks. Discussion with the lecturer was carried out to allow better understanding of the unit. The researcher was given access to the wiki, which enabled him to observe any changes made by the students. The built-in system log was used as a means to observe the usage, and the researcher also periodically sighted the wiki pages. There was only a single wiki used in this case and the whole class shared and built their pages in it. The online questionnaire was then deployed, whereby individual students were invited to consent to be involved in the study and to respond to the questionnaire. The detailed questions of the questionnaire can be seen in Appendix A: Research Instruments.

Although the second unit was separate from the first, the majority of the original first-unit students enrolled in it. Those who had discontinued their studies or had not taken the first unit at the time of the research were not included. At the end of the second semester, a semi-structured interview was conducted; two or three of them at random being interviewed at the same time, due to logistical limitations.

6.5 Results

The respondents' technology backgrounds were very diverse, ranging from those who were technology enthusiasts to those who were technology averse. There were also a large number of mature-age students in this unit. However, the study did not intentionally select any particular respondent, and everyone who volunteered to participate was reviewed.

6.5.1 Questionnaire

The Web 2.0 tool used in this case study is the wiki. Therefore, the students primarily reflected only on the wiki unless asked explicitly to do otherwise. In most cases the opinions focused on the wiki. The questionnaire thus provided an insight into the respondents' experiences in regards to their familiarity and attitude towards the use of a wiki, although not necessarily the exact brand of wiki they use in the unit.

In this third case study, Table 16 shows two questions (11 and 12) about the familiarity of the respondents with the wiki; the data revealed a greater range of familiarity with the wiki amongst the respondents than did the other two case studies. This was despite the fact that the majority claimed to be unfamiliar with wikis, especially outside the academic context.

Table 16. Case study 3 - Familiarity with wiki (n=30)

Questionnaire Question	Median	Mean	σ
11. I have used some or all the tools in another unit before.	3.00	2.93	1.13
12. I have used some or all the tools for social purposes before.	3.00	2.67	1.03

Although the respondents were relatively new to the wiki, they were familiar with basic ICT tools such as email, web browser and messenger. The majority who were familiar with wiki had been exposed to wiki through the academic courses within the university.

In this case study respondents gave positive responses in term of their expected ease of use of the wiki, and responding slightly above the median value. (See Table 17).

Table 17. Case study 3 - Ease of use of wiki (n=30)

Questionnaire Question	Median	Mean	σ
1. I found it easy to use the wiki to develop the project documents online.	4.00	3.60	0.67
2. I needed additional tools to support the development of the project documents.	3.00	3.14	0.79

Although respondents considered themselves to be = novice users, but majority of the respondents indicated during interview that they were comfortable with the tool and gave positive comments on their experience at the end of the study, and only 10% reporting negative feedback due to difficulties in navigating around the wiki, or not having enough time to work on the wiki.

Respondents' general expectations towards using and depending on the wiki was probed in questions 5, 10, and 13 as seen in Table 18. Responses tend to be close to the median value of 3.00 with the average slightly higher.

Table 18. Case study 3 - Usefulness of wiki (n=30)

Questionnaire Question	Median	Mean	σ
5. I would not have been able to collaborate with my peers as effectively as I did without the support of the tools.	3.00	3.07	0.83
10. I prefer to coordinate teamwork with my peers through the use of the tools rather than manually.	3.00	3.10	0.88
13. I can always substitute the role of the supporting tools with manual process.	3.00	3.32	0.70

Somewhat similar results were recorded in relation to respondents' preferences in working with peers assisted by technology, and their dependence on the tool to support their group collaboration (Table 19); although the responses tended slightly to the positive, in particular for coordinating the workload and sharing deliverable documents.

Table 19. Case study 3 – Perception of wiki (n=30)

Questionnaire Question	Median	Mean	σ
9. I found that the tools were very useful for me to divide the workload with my peers.	4.00	3.53	0.82
7. In my group, I used different tools to communicate with different people.	3.00	3.29	0.86
6. I found it efficient to use the wiki to share the project documents I had produced with others.	4.00	3.37	0.89

Questions 9, 7 and 6 addressed perceptions of the wiki as a medium of communication and sharing documents. The data indicated that respondents responded positively towards the wiki for such use (Table 19).

Table 20 displays further the uncertainty felt by respondents in this case study; when asked how the tool influenced the way they interacted with their peers, the responses were equally distributed, giving indecisive median and mean value, as shown.

Table 20. Case study 3 - Influence of the wiki (n=30)

Questionnaire Question	Median	Mean	σ
8. I found that the tools we used have influenced the way I communicate and work with my peers.	3.00	2.90	0.96

Question 3 and 4 addressed respondents' perspectives on their contribution in the group collaborative tasks (Table 21). The data indicated that respondents had positive expectations about their ability to contribute to the team's work.

The groups coordinated their workload differently, and many students in this case study also pursued self-interest as it became apparent in the interview that for some it was as much as about dividing the work amongst team members as it was about pursuing their topic of interest.

Table 21. Case study 3 – Collaboration (n=30)

Questionnaire Question	Median	Mean	σ
3. With my peers, I value their contribution to my own work.	4.00	3.84	0.37
4. With my peers, I can contribute to improve his/her work.	4.00	3.81	0.40

Summary

Overall respondents showed positive responses in their group collaboration with their peers; good attitude towards the use of wiki, but they were indecisive in their expectations about using the tool to support their collaboration.

6.5.2 Observation

In this section, several screenshots of the activity on the wiki are shown. However, because the content on the screens is deemed to be private, names and any references to the personal identity of the participants have been blurred.

These screenshots were snapshots from the periodic observation conducted throughout this study, and since the intention of this observation was to see how the group used their wiki to facilitate their collaborative activity, and not to see the progression of changes on the page over time, therefore only a single screenshot is shown rather than a series of time-lapse screenshots.

Figure 38 shows the front page of the wiki used in this case study. The lecturer set up the front page with a table to group the students according to their selected topics, and to provide some organisation to the content. Each group with a similar topic could be linked to the same row of the table. The lecturer also used the front page to provide links to the task instructions, as can be seen in the right hand sidebar in Figure 39 marked by the red dotted square. All instructions from the lecturer regarding tasks were given only in this manner, and the information was delivered through the wiki.

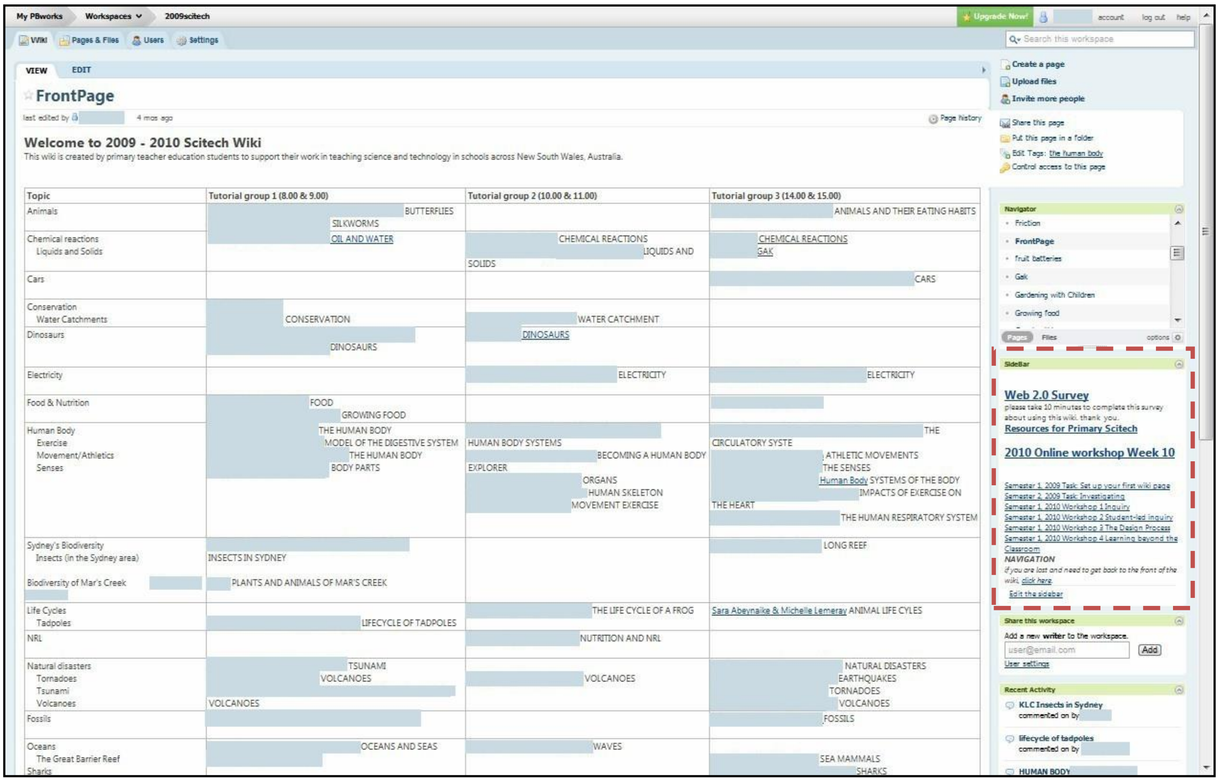


Figure 38 Case 3 - Front page (a)

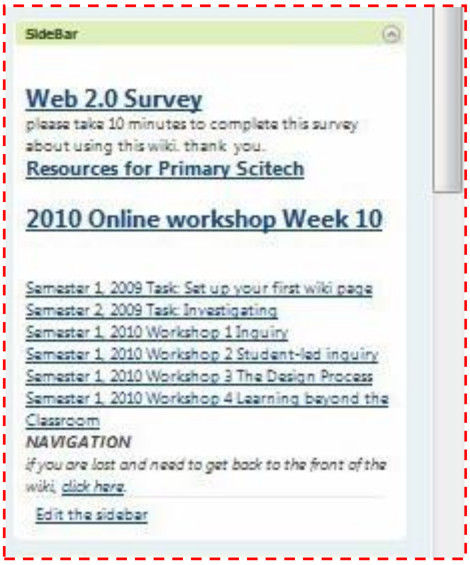
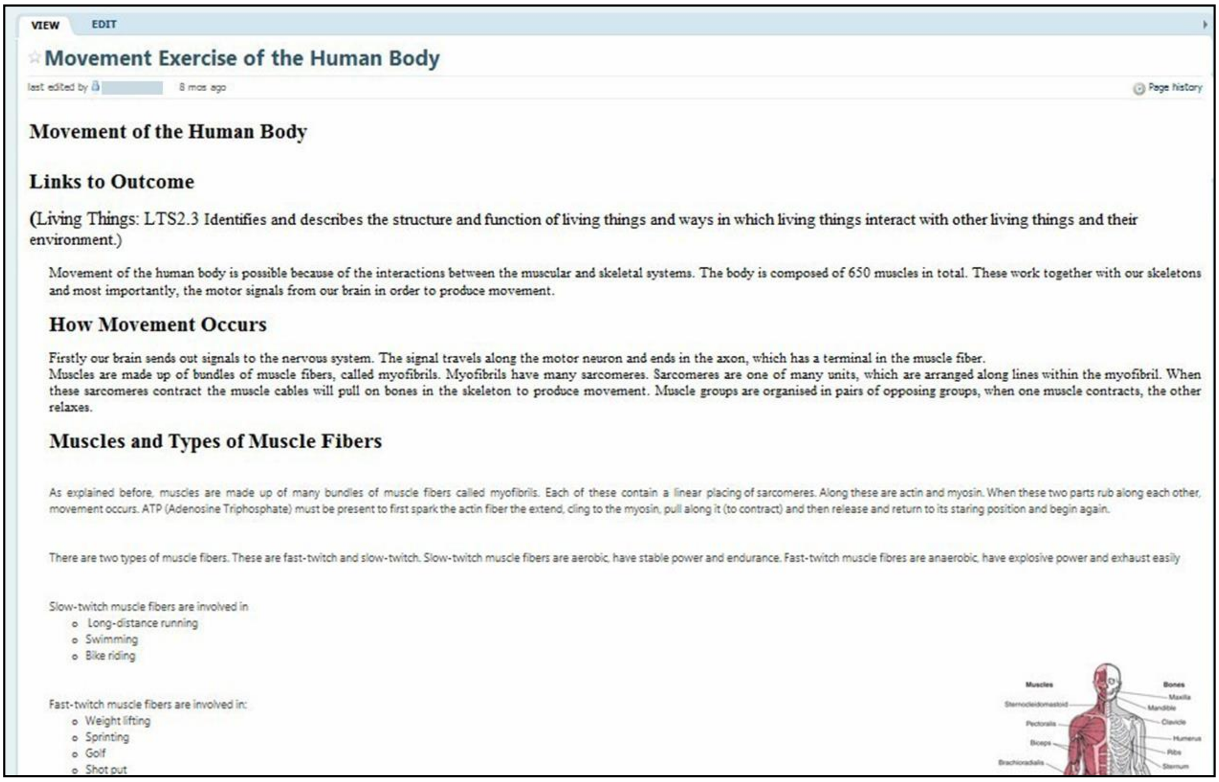


Figure 39 Case 3 - Front page (b)

Each group was given its own wiki page as a starting page for planning. Figures 40, 41 and 42 show three page examples from three different groups who nominated the topics of: 'Movement exercise of the human body', 'Rainbows' and 'The Science of Volcanoes'. Students had to identify and then make links between the lesson they designed and the standardised syllabus learning outcomes. An introduction was also required, as well as details of any supporting multimedia required to allow for multi-modal learning by their students. They were also required to make plans for assessments as well as other pedagogical aspects they considered important for the lesson to be successful and meaningful.



VIEW EDIT

Movement Exercise of the Human Body

last edited by 8 mos ago Page history

Movement of the Human Body

Links to Outcome

(Living Things: LTS2.3 Identifies and describes the structure and function of living things and ways in which living things interact with other living things and their environment.)

Movement of the human body is possible because of the interactions between the muscular and skeletal systems. The body is composed of 650 muscles in total. These work together with our skeletons and most importantly, the motor signals from our brain in order to produce movement.

How Movement Occurs

Firstly our brain sends out signals to the nervous system. The signal travels along the motor neuron and ends in the axon, which has a terminal in the muscle fiber.
Muscles are made up of bundles of muscle fibers, called myofibrils. Myofibrils have many sarcomeres. Sarcomeres are one of many units, which are arranged along lines within the myofibril. When these sarcomeres contract the muscle cables will pull on bones in the skeleton to produce movement. Muscle groups are organised in pairs of opposing groups, when one muscle contracts, the other relaxes.

Muscles and Types of Muscle Fibers

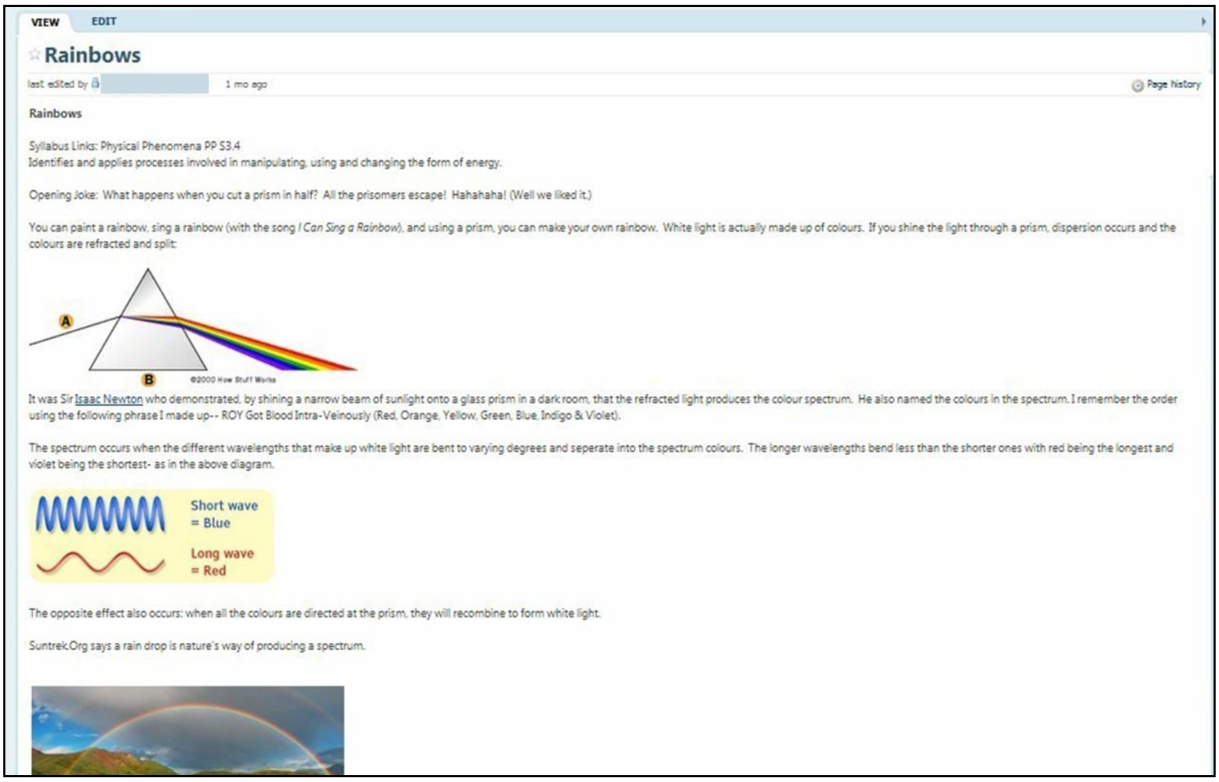
As explained before, muscles are made up of many bundles of muscle fibers called myofibrils. Each of these contain a linear placing of sarcomeres. Along these are actin and myosin. When these two parts rub along each other, movement occurs. ATP (Adenosine Triphosphate) must be present to first spark the actin fiber the extend, cling to the myosin, pull along it (to contract) and then release and return to its staring position and begin again.

There are two types of muscle fibers. These are fast-twitch and slow-twitch. Slow-twitch muscle fibers are aerobic, have stable power and endurance. Fast-twitch muscle fibres are anaerobic, have explosive power and exhaust easily

Slow-twitch muscle fibers are involved in
- Long-distance running
- Swimming
- Bike riding

Fast-twitch muscle fibers are involved in:
- Weight lifting
- Sprinting
- Golf
- Shot put

Figure 40 Case 3 - Lesson plan sample 1



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Rainbows

last edited by 1 mo ago Page history

Rainbows

Syllabus Links: Physical Phenomena PP S3.4
Identifies and applies processes involved in manipulating, using and changing the form of energy.

Opening Joke: What happens when you cut a prism in half? All the prisomers escape! Hahahaha! (Well we liked it.)

You can paint a rainbow, sing a rainbow (with the song *I Can Sing a Rainbow*), and using a prism, you can make your own rainbow. White light is actually made up of colours. If you shine the light through a prism, dispersion occurs and the colours are refracted and split:

It was Sir Isaac Newton who demonstrated, by shining a narrow beam of sunlight onto a glass prism in a dark room, that the refracted light produces the colour spectrum. He also named the colours in the spectrum. I remember the order using the following phrase I made up-- ROY Got Blood Intra-Veinously (Red, Orange, Yellow, Green, Blue, Indigo & Violet).

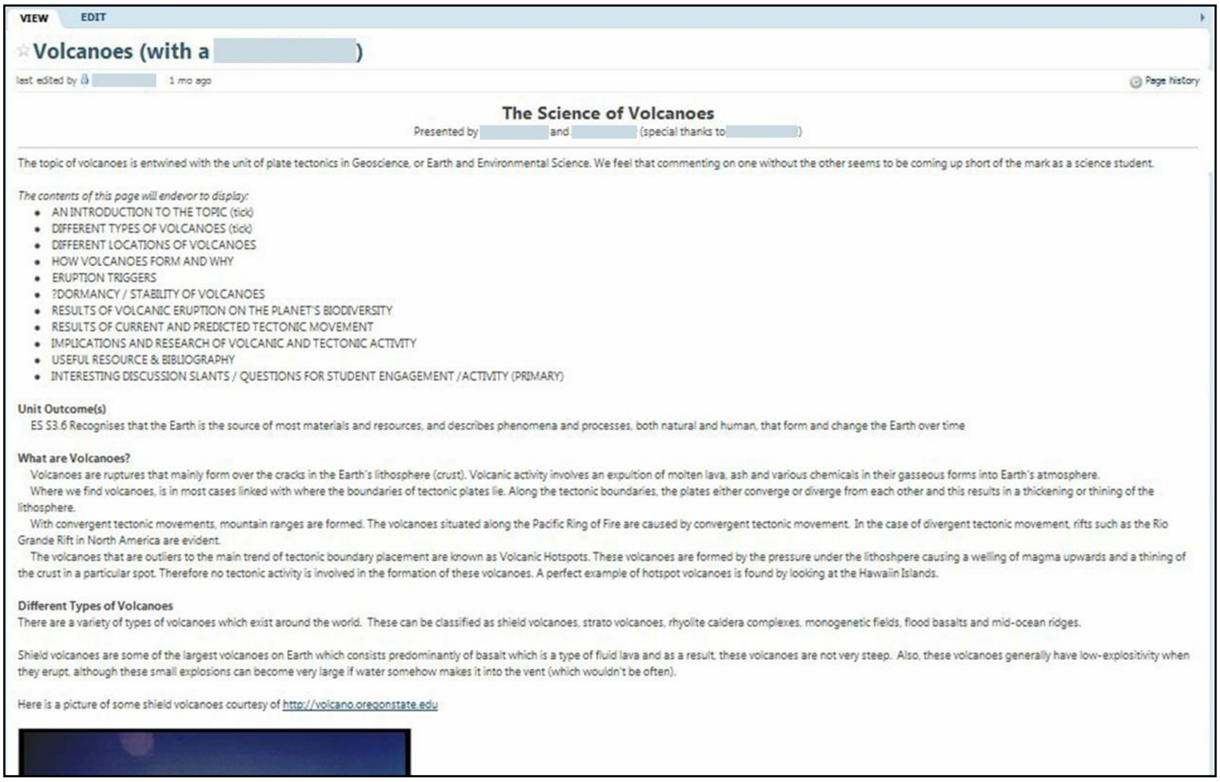
The spectrum occurs when the different wavelengths that make up white light are bent to varying degrees and seperate into the spectrum colours. The longer wavelengths bend less than the shorter ones with red being the longest and violet being the shortest- as in the above diagram.

Short wave = Blue
Long wave = Red

The opposite effect also occurs: when all the colours are directed at the prism, they will recombine to form white light.

Suntrek.Org says a rain drop is nature's way of producing a spectrum.

Figure 41 Case 3 - Lesson plan Sample 2



VIEW EDIT

Volcanoes (with a)

last edited by 1 mo ago Page history

The Science of Volcanoes

Presented by and (special thanks to)

The topic of volcanoes is entwined with the unit of plate tectonics in Geoscience, or Earth and Environmental Science. We feel that commenting on one without the other seems to be coming up short of the mark as a science student.

The contents of this page will endevor to display:

- AN INTRODUCTION TO THE TOPIC (tick)
- DIFFERENT TYPES OF VOLCANOES (tick)
- DIFFERENT LOCATIONS OF VOLCANOES
- HOW VOLCANOES FORM AND WHY
- ERUPTION TRIGGERS
- ?DORMANCY / STABILITY OF VOLCANOES
- RESULTS OF VOLCANIC ERUPTION ON THE PLANET'S BIODIVERSITY
- RESULTS OF CURRENT AND PREDICTED TECTONIC MOVEMENT
- IMPLICATIONS AND RESEARCH OF VOLCANIC AND TECTONIC ACTIVITY
- USEFUL RESOURCE & BIBLIOGRAPHY
- INTERESTING DISCUSSION SLANTS / QUESTIONS FOR STUDENT ENGAGEMENT /ACTIVITY (PRIMARY)

Unit Outcome(s)

ES S3.6 Recognises that the Earth is the source of most materials and resources, and describes phenomena and processes, both natural and human, that form and change the Earth over time

What are Volcanoes?

Volcanoes are ruptures that mainly form over the cracks in the Earth's lithosphere (crust). Volcanic activity involves an expultion of molten lava, ash and various chemicals in their gasseous forms into Earth's atmosphere.

Where we find volcanoes, is in most cases linked with where the boundaries of tectonic plates lie. Along the tectonic boundaries, the plates either converge or diverge from each other and this results in a thickening or thining of the lithosphere.

With convergent tectonic movements, mountain ranges are formed. The volcanoes situated along the Pacific Ring of Fire are caused by convergent tectonic movement. In the case of divergent tectonic movement, rifts such as the Rio Grande Rift in North America are evident.

The volcanoes that are outliers to the main trend of tectonic boundary placement are known as Volcanic Hotspots. These volcanoes are formed by the pressure under the lithoshpere causing a welling of magma upwards and a thining of the crust in a particular spot. Therefore no tectonic activity is involved in the formation of these volcanoes. A perfect example of hotspot volcanoes is found by looking at the Hawaiin Islands.

Different Types of Volcanoes

There are a variety of types of volcanoes which exist around the world. These can be classified as shield volcanoes, strato volcanoes, rhyolite caldera complexes, monogenetic fields, flood basalts and mid-ocean ridges.

Shield volcanoes are some of the largest volcanoes on Earth which consists predominantly of basalt which is a type of fluid lava and as a result, these volcanoes are not very steep. Also, these volcanoes generally have low-explositivity when they erupt, although these small explosions can become very large if water somehow makes it into the vent (which wouldn't be often).

Here is a picture of some shield volcanoes courtesy of http://volcano.oregonstate.edu

Figure 42 Case 3 - Lesson plan sample 3

As seen in the screenshots above, when the students were constructing the page, they prepared not just the content, but also the layout and design, indicating that they were also considering how to use the wiki during a class presentation. None of the observed groups made any individual markings to flag their personal contributions to the lesson plan. They considered the final document as a single, collaboratively-produced artefact owned by all participating members. Because the lecturer had placed emphasis on producing a *shared* lesson plan, the wiki was comprehensively used as a shared place. This confirmed Kirkwood's explanation that students would approach a task according to what they perceived the lecturer expected from them (Kirkwood, 2009).

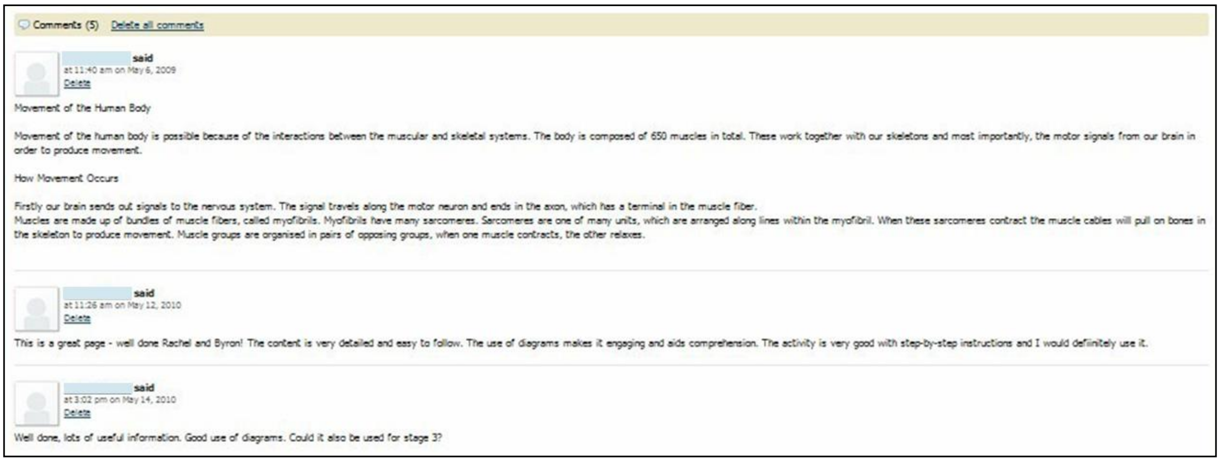


Figure 43 Case 3 – Comments (a)

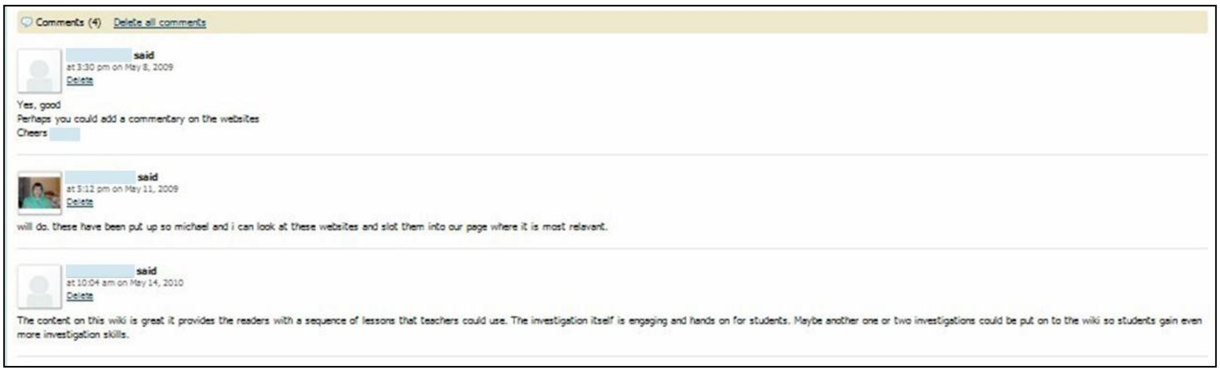


Figure 44 Case 3 – Comments (b)

The lecturer also encouraged students to comment on each other's work. As observed in Figure 43 until Figure 46, students did comment each other work; however, a closer look revealed that some of the comments were largely superficial rather than critical or reflective. A deeper level of feedback may have been more meaningful to them individually, as well as collectively.

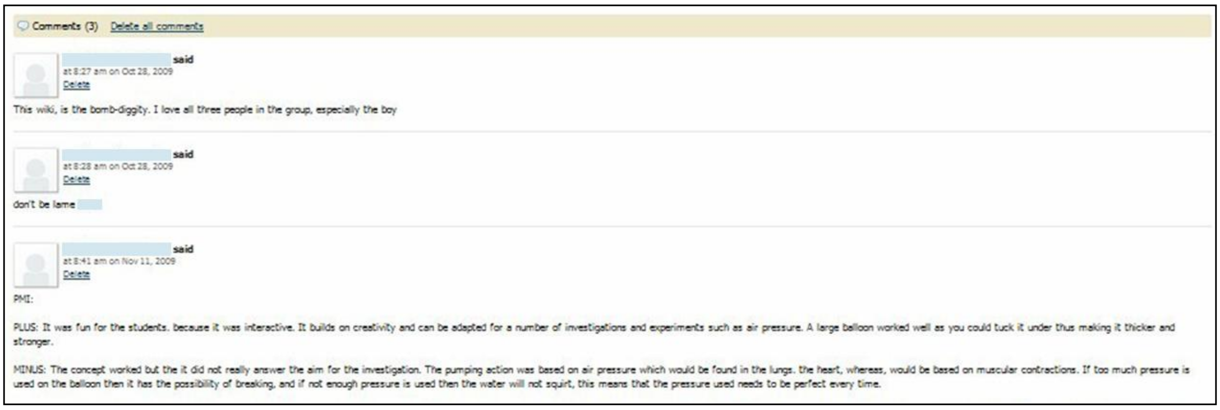
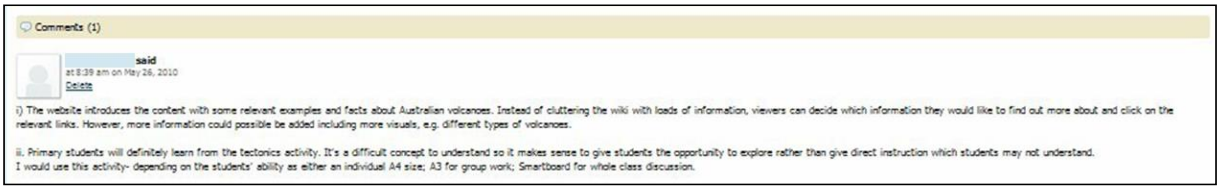


Figure 45 Case 3 – Comments (c)



Comments (1)

said
at 8:39 am on May 26, 2010
Delete

i) The website introduces the content with some relevant examples and facts about Australian volcanoes. Instead of cluttering the wiki with loads of information, viewers can decide which information they would like to find out more about and click on the relevant links. However, more information could possible be added including more visuals, e.g. different types of volcanoes.

ii. Primary students will definitely learn from the tectonics activity. It's a difficult concept to understand so it makes sense to give students the opportunity to explore rather than give direct instruction which students may not understand.
I would use this activity- depending on the students' ability as either an individual A4 size; A3 for group work; Smartboard for whole class discussion.

Figure 46 Case 3 – Comments (d)

On the other hand, some students did make a meaningful contribution in their comments, such as exploring the possibility of adapting similar content to different stage group of students (see Table 8). One particular group also responded to the comments made about their lesson plans and formed a small dialogue between the contributor and the person making the comments.

Summary

In summary, similar to the second case study, respondents in this case also generally had a high degree of indecisiveness in their expectation of the wiki, they were uncertain how they could benefit from the wiki, and how to use it better in the future,

6.5.3 Interview

The semi-structured interview was conducted as a group interview for logistical reasons; students had limited face-to-face time available for an interview while on campus. As a result, they were selected randomly, based solely on their availability on the day of the interview and therefore they did not necessarily come from the same group.

There are a total of 152 students enrolled in the class, 34 of them participated in the survey, and from those survey participants, a total of nine of students were interviewed.

To discuss the findings from the interview, this chapter will summarised the responses and present the summary one activity system's sub-system at a time (Engeström, 1987).

Production

Some respondents were not sure whether what they had done could be considered collaboration because each group member differed in the degree to which they had contributed to the group. Notwithstanding this concern, all participants acknowledged that their colleagues were mature participants and that no-one 'slacked off' to become a burden for others.

In many groups, multiple users did the editing work of the wiki together. They collected images, YouTube videos, various documents (e.g., pdf, spreadsheet) and also a significant number of Internet links individually, and then stored them in the wiki for discussion when they met in class. During the discussion they then edited, refined and organised the collected resources for inclusion in the final, deliverable product to be included in the lesson plan. Their realisation as to the types of media the wiki could support did not happen all at the same time; some respondents indicated that they became increasingly aware as time went on of the wiki's affordance for attaching images, links and YouTube videos.

Many respondents indicated that it was easy to co-produce the artefacts, even though they had to negotiate their contributions, resolve conflicts, and build trust amongst the group:

> *But I think the task was explained pretty well. It wasn't a difficult task, so we were able to go home and work on it and add stuff. That meant that we had to trust that the other person was going to add their share of things. But, with Wikis you know you can always check that, so it wasn't too difficult to collaborate.*

Collaboration was primarily done within the group and they were all co-producing the artefact. In one group the respondents commented that they added information and resources without talking to each other first; they simply added things into the wiki and trusted that their peers would do their share of the work. Even when their partner had difficulty coming to class, they considered themselves managed to still perform their group function through the wiki from home.

Yeah, we just added, like I saw what she'd done and she'd just started putting information - because ours was on volcanoes, and I just researched some more and added to what she'd already done.

Using? No, it was very easy. I'd never used one before, but no, I never even really looked at a wiki before.

The display of trust between the participating members of a group was visible in this case. The respondents realised that they all had the capability to edit a wiki page, and, because it was a shared wiki, everyone could edit everyone else's wiki page. Yet, this also meant that the danger existed for students to accidentally delete someone else's work. However, such circumstances were not a significant concern and team members expressed their caution when doing edits:

Everyone has the thing about them - we just do what the teachers ask. No one's really going to slack off or go off task.

I think everyone was on the same level. Everyone was administrator - administrative powers. So you could change and you could be really silly and type in ridiculous things if you wanted to, but I think most people were sensible about it and diligent with their work.

However, one particular group mentioned that they also did not hesitate to go into their peer's section of the wiki to make a contribution while their peer was working on the page. This attitude was quite different to the generally cautious and hesitant practices demonstrated by others towards editing the work of others.

Many respondents indicated that during the first part of the year, their contributions to the wiki were primarily done within a single page; in other words, they all edited only the one page rather than adding new pages. In the subsequent semester, the focus shifted towards reviewing, although they still edited and added new content. They also worked on the look of the wiki in an effort to make it more appealing.

Respondents acknowledged that due to time constraints they were unable to put in as much effort on the wiki pages as they would have liked. Moreover, because it was not an assessed task they found it hard to justify spending more of their time on it to achieve the standard they wished to achieve:

> *Yeah, but it's just a time thing. Like I said, that's why it would be good if it was an assessed task because then you have to put the time to it. Whereas you have to prioritise what's assessed and what's not unfortunately.*

One of the respondents also briefly compared the wiki to a blog and pointed out the similarity that both afford:

> *That's the other thing, Wikis can be used as a blog as well - an alternative to a blog site. You could just create your own page, write your stuff, and then it's like an internal, or intranet blog. Where whoever you want to see the blog, can see it.You can make it a closed thing. I'm doing that at the moment with one of my friends. So we just share our ideas and stuff. It's only us that can see it. So we blog to each other and it's helpful that way.*

Consumption

In this case study, the consumption activity was not emphasised as the attention was focused on the co-production of lesson plans. The participants were at the same ability level as producers and had their own interests in the production of a lesson plan.

Communication

Because the lecturer in this case encouraged comment sharing among the participants there was significant reflection on how the communication occurred, particularly during the second semester of the case. Some of the respondents welcomed the comments made by other groups and considered them to be valuable pieces of information for future reference:

Well I think it's different in that, with Wikipedia, that's a huge collaboration of people all over the world.Whereas here, you're working with somebody that you see at least twice a week at lectures and so, you know there's a relationship there and you know them.If there was an issue and you wanted to go about something differently, then you'd just talk about it.Not that it came up that way, but if there was, then you'd just talk about it.Make a decision jointly.I don't think that there were too many issues like that.

Maybe if you're getting at what happens if we don't have face to face contact and we do use Wiki's, then I do foresee some problems there.You'd have to use the comment section I think below.You know how there's a comment section ... as well.So before you edit someone else's work, maybe - if I was working in someone in Queensland or something like that on a Wiki page, then I would actually politely comment and say, should we change this, this, this, this.Is this right?They can comment back as well.I'd expect them to not change anything I've done unless they've told me, look, this might be a better way of writing it or, what do you think about this.Then we can go and change it.Because I feel like the page is the official thing and the comments could help the collaboration process.Either that or create another page where you can just ... Email, or email, yeah.

However, although the majority of respondents were aware of the comment feature in the wiki, not many used it for two-way interaction. They explained that because they did not access the wiki daily, the frequency of their overall usage was very low, and therefore they did not comment on each other's work as much as they would have liked:

Well, if there is something you really need to say, then obviously the comments are good.

Or if some other people don't understand something.

You can add if you've got other information to put on there or pose a question that's good, it can get people thinking and adding to the wiki.

Some of the groups also used other tools to supplement the wiki in their communication with their peers. This included email, MSN chat, Facebook and text messaging to support their needs, with email being the predominant choice:

Yeah, I guess for me, e-mail. E-mail was the biggest one for us. Not really any of these chatting sites or anything, I can't be bothered.

Quite a number of the respondents said that they utilised the comment feature because it was required in the unit. On occasions the lecturer also dedicated time for students to comment on each other's work. Hence, respondents felt that some of the comments were simply done to satisfy that requirement. Yet, they also acknowledged that proper use of the comment feature would be useful to gain a deeper understanding of the way their product would be received by others. Many used the comment feature to provide positive feedback to another group member when they contributed a good resource.

Distribution

The majority of the collaborative negotiations were accomplished when the pairs met in the classroom and worked on a single computer or notebook. However, when they were away from the classroom, many of the students continued to collect and add resources to the wiki and then discuss them in class before carrying out the final editing, again on the wiki:

> *I guess we just brainstormed what we thought might be good to include and then we kind of just went about and got our own thing and then we just came back together and figured out what we were going to put together and type up. So it was all about just breaking up the workload.*

Although most participants could work out their workload distribution, few participants expressed dissatisfaction in the way the collaboration was done in their group. Some respondents pointed out that they could tell whether or not their group members had been doing their share of the workload through the system log:

> *Not really, I found it quite an easy thing to use, and it was all there, because I find sometimes with group work, if you don't meet for a week or something, you're waiting to find what your group member has or hasn't done. But, I guess in that sense, it's right there and it was very easy to know if they had done anything or not.*

The greatest amount of dissatisfaction towards the workload distribution was due primarily to the perceived imbalance in workload by some students. In some instances, the more technology savvy members of the group would handle the additional workload updating the wiki on behalf of their group, as their peers often experienced problems with accessing the system.

6.5.4 Integrated discussion

In this case study, the wiki was created for primary pre-service teachers to develop science lesson plans using technology in schools across New South Wales, Australia. From the beginning of the semester, the lecturer positioned the wiki as a place where a group of pre-service teacher students could collaboratively co-produce a detailed lesson plan. At the end of the study, 50% of the respondents considered the wiki a great tool to use for sharing resources, while only 14% thought the contrary. Twenty-nine per cent (29%) remained undecided and one person considered he/she had no use for the wiki at all.

Students' familiarity with the tool

It was observed that the proficiency of the participants in using the wiki consistently and continuously improved over time. Although some of them experienced technical difficulties, in general, the respondents became aware of the wiki's usefulness and continuously applied what they knew to independently explore the tool further. A majority of the participants became more confident when using the wiki to fulfil their collaboration needs, and found that the tool was relatively easy to use. They considered the wiki to be straightforward and easy to use, despite never having used such technology before, either in their learning or their personal life. One respondent admitted that s/he had never heard the word "wiki" before, while others mentioned they had seen one, although they had not interacted with it:

It was really easy to use actually. ... The hardest thing about it was remembering our passwords.

Yeah, that's probably true.Like I found it really easy to set it out really well - add in the pictures if we needed pictures and things like that. So I thought that was really good.

Students' access to the tool

A few participants experienced difficulties in getting access into the system, despite the introductory workshop given by the lecturer. Several participants said they were having login issues, while others were having difficulties in getting familiar with the application interface and navigating around it. These participants then had problems getting over this hurdle and did not take up the wiki to the same extent as the participant who experienced greater success and who felt confident using it.

This Technological Knowledge (TK) (Mishra and Koehler, 2006) and the level of expertise it implies was crucial in engaging the respondents in their use of the technology. This was evident not only in their efforts to collaborate with others, but also in their stated preparedness to use the technology in their future teaching practice.

One of the respondents mentioned that after using the wiki, s/he introduced the tool to friends from another class and they too found it easy to use and beneficial to their future work:

> *My friend described it best. I introduced it to a friend later on, and he said, oh, this is basically Microsoft Word, but you can organise all your stuff. So the Wiki pretty much is like Microsoft Word, but you can do more with it. It's more about the collaboration side of things. So I agree, it's sort of finicky, but I think it's very well - it categorises things very well into pages and files.*
>
> *The first time and I used it a lot after because I did a group assignment. I actually said hey guys, give me your email addresses, I'll give you this good site and we can share our notes together. It worked for two of the study - I created two study groups that semester using the Wiki.*

As the students became more familiar with the tool, they also became more aware of the different modalities they could include in their teaching content. Their Content Knowledge (CK) thus became more rich and diverse, irrespective of whether they were designing to deliver factual, conceptual, procedural or metacognitive content (see Anderson and Krathwohl's work in 2001 as shown in Figure 9 in Chapter 2).

Students perception of sharing resources

As mentioned earlier, the affordance of sharing was very strongly perceived by the participants. This outcome was aligned with the decision by the lecturer to position the use of the tool at the start of the semester. As a result, the students valued the use of wiki as a centralised storage facility for shareable resources in their teaching and students' learning:

"It's a better source of getting information."
"Yes, like grouping information together for one easy access point."
"Doesn't waste time, perhaps."

Students value the content highly

The strong positive perception of value was formed not simply because of the tool, but also because the content they were sharing was a primary motivator for sharing to take place. When asked about the usefulness of the wiki, those who responded positively referred to the content of the wiki as the pulling-factor for them, although they also were aware of the need to validate the collected resources prior to using them in the classroom during their practical experience.

I think so. It provides us with all these new - like different resources and lesson plan ideas and things like that. Because everybody's topic was different and it relates to a lot of things that we need to teach in primary schools. So I think it's really beneficial.

They reflected positively on their own experiences when developing the shared wiki in pairs, as well as collectively when the pairs shared their work with the class. The experience was seen as something that they could refer back to when they started teaching in the classroom:

Yeah, it's great from a teacher's point of view. But it's also great from a student point of view and from the point of view of when you're actually in the classroom, like, doing that with our students, would be fantastic. Just the process - it would be really engaging. Then they could look at other people's work and yeah, they'd be just looking at information in a different way and I think that would be using a higher order of thinking skills, which would be great. ... Yeah, it's just something different. Not just doing an information report which is so boring. This is whole-class collaboration and it's just really cool. It's interesting.

Students' extension of their collaboration experience

Participants were enthusiastic about the possibility of using the wiki in their own classrooms when it was their turn to teach. Some respondents thought quite deeply about its use for such things as breaking down the work into smaller chunks for different groups of students to collate and then use towards a presentation, which is essentially the exploration of affordance in division of labour:

> *If you started them off early, just doing simple ones - if you just did a class discussion about something and you just posted a sentence about what they think about it, it wouldn't have to be detailed information, it might be just from their own experience or background knowledge and just do it that way. Just keep it really simple for the younger years.*
>
> *I mean, let me see - like say we were doing a broad topic, say colonisation of Australia, you could have different groups working on different parts. You could have one group doing Captain Cook's voyage, another group doing the First Fleet, then early colonisation, and then Aboriginal's perspective. Then you could put it all together and actually present the work that the people have done. Or you could get the students to log onto the Wiki's, look them up, and then do a presentation to the whole class back of what they've found out from the process.*

Some considered using the wiki as a storage system, not just for personal storage and retrieval, but for longer-term use such as when they were teaching a drawn-out science process. The wiki could then be for data-logging over a period of time. Such thoughts indicated the respondent was considering a different way to consume the data from the wiki; that is, over a longer period of time. This was a variation on what they themselves had done in this case:

> *Yeah, I definitely see the benefit of students using a Wiki.It's a definitely more engaging process I think. It's something that can be kept for a really long time. So you could have a Year 5 class for like 10 years, and every year ... you can go back over and go, well this is what these guys did last year, as examples and things like that. So I think it's really beneficial.*

Some students were also considering connecting their class with a class from another part of the world based on a topic of common interest. They were building on their own experience of sharing, but were extending the boundaries of participation to include transnational participants, even those in different time zones. This would enable them to share and compare their scientific experience, or simply to connect with a wider community of practice in the field of science:

> *Students could set up their own ones on the Internet with other schools or friends - well not friends, but just anyone - like similar interest groups. But if they wanted to explore certain topics then they could set up their own Wiki and get a perspective from someone in South America or Europe or something.*
>
> *No, it would be good to - once we all go out, it'd we be good to do a Wiki across different schools - you know they have the books wraps and everything, through the [DT]. But you could do two stage three teachers could do a Wiki, and both classes could contribute across schools. I think it's good to use in your class, but they're still face to face, but if you do it across schools and there's a joint collaboration.*

The usages which the respondents envisioned were remarkable, considering their background and grasp of technology were limited to begin with. However, they let their imaginations run free and this enabled them to perceive other affordances, even those which they themselves had not yet experienced. This all started from their positive experience in using the wiki as a shared platform to co-produce lesson plans:

> *No, it's just you have to figure it out. There's no, if you want to do this, this is how to do it.*
>
> *You do need a bit of technical support, whether it's from your peers or the teacher. You do need someone who knows what they're doing to just give you a bit of push in the right direction.*

Some respondents also indicated their appreciation and awareness of the affordance difference between different tools. As they contemplated their own usage of the wiki, getting familiar with it step-by-step through the guided tasks, they became familiar with the wiki and confident enough to make a distinction about what a wiki can and cannot do, and what other tools could do to substitute or complement functions lacking in the wiki:

> ***(person 1)*** *Just because I found the Wiki a bit fiddley.Wiki's probably a better way to go, but...*
>
> ***(person 2)*** *I think Wiki's - it's just more formal as well. So when you're doing assignments and you're doing group work, you don't Facebook, you use Wiki because it's got the Word function.*
>
> ***(person 1)*** *Yeah, and you can organise the information better.*
>
> ***(person 2)*** *Yeah, I don't think use Wikis to communicate. You use Wikis to present and collaborate. But I think you use other means like email and social networking like Facebook to do the communication, the day to day communications. Wiki's like the final product. That's your spreadsheet of all the stuff you want to do.*

Students value the community of practice

One of the factors that contributed to the content being perceived as relevant was that the wiki was being used by people with similar interests. As a Canadian study revealed, the community of practice amongst same-level pre-service teachers can be a powerful format that enables these teachers to deepen their competency development (Goodnough et al., 2009). Within this case, each student was a filter who screened and organised the information before placing it in the wiki. Thus, the content shared in the wiki was of a higher value than in its original raw form. It was processed information rather than raw data, and the students knew the value of it:

> *So as teachers we'll probably all look at it in a similar way how we can use it in class. If it's not useful then I don't think we'd put it up there. So that would be a good way of filtering the information.*

Another respondent explained the benefit as 'leaching', indicating that they could 'leach' from other people's learning; they were able to pick each other's brains and thus learnt more in a shorter time-span:

> *It was just so I could leech - study off other people. But I also did share, so it worked really well. But no, I hadn't seen the Wiki before.*

One respondent in particular described him/herself as addicted to the content. (S)he found valuable content in it and was driven by curiosity to maintain engagement with the content for a much longer time. Respondents generally also tended to comment and get more deeply involved when they found the content to be relevant to themselves.

> *I don't know. I found it addictive. Once I started I'm like, I wonder about that one. Oh, not so good, I'll go find another one. Oh, I like that one. So yeah, it was a bit addictive.* ***(Did you go through the whole Wiki?)*** *Oh not the whole one. But the topics that I found interesting I took a quick look at.* ***(Did you comment on it?)*** *Yeah, not all the time - but a good part of the time yeah.*

7 Conclusion

7.1 Discussion of findings

This study started out to explore how students at a higher education level interact with Web 2.0 tools, in particular the wiki, in their collaborative learning activity. The study sought to understand what affordances the wiki offers to students undertaking collaborative learning tasks; what learning discourses these affordances support; how students perceive those affordances and use them in their collaborative learning activity, and what influence academics have in this process.

The study used Engeström's activity theory (1987) to both frame the study and use it as a lens for analysis, reapply Gibson's and Norman's conceptions of affordance within a tool-mediated collaborative learning context. It was found that this framing was very useful to guide the inquiry to cover various facets of tool-mediated collaborative learning without becoming too rigid or limiting with the analysis itself.

7.1.1 Affordances of the wiki

As mentioned at the beginning of this thesis, this study did not attempt to create an extensive list of affordances offered by a wiki. This is because there is no one prescribed 'way' of using a wiki when the utilization of the wiki is a result of perception of an affordance, which as foreshadowed in the literature review and earlier discussions, is an individual construct formed by each member's prior knowledge and experiences. As such, we lack an objective measure to give judgement if one way of using the wiki is correct or the other way is wrong. When such a boundary is absent, there is no way to establish a complete list of affordances, as one will only be supersede with others created with more imagination.

However, in this section, a summary from observations conducted in this study can be drawn about the different usage models of the wiki conducted by the participants in this study. The different usage models correspond to the degree of complexity of the collaboration (See Table 22).

Table 22. Collaboration, technical affordance and utilization of wiki

Collaboration	Technical Affordance	Utilization
Curation of content	Storing files	At start, as shared drive where a single site used to place files instead of sending multiple email attachments.
		A more advance use is to include an agreed schema for organizing these files. Usually a simple schema being used, e.g. based on file types or author.
Communication between members	Broadcasting messages	The wiki was used as a notice board where anyone can post information directed to anyone or everyone. Identifier also used to self-identify contributions as a form of organization of the messages.
Coordination of work		A more sophisticated usage was to use the same mechanism afforded by the wiki to coordinate workload, communicate with other members about their progress and divide the work.
Contextualization of content	Linking contents	Similar to content curation, however there is a meaning making process apparent in the text. The wiki consisted of multiple pages which linked to one another tough negotiation of group members to make sense as a whole and gives a purpose for each of the piece.

Rather than being an extensive list, Table 22 demonstrates the relationship between form of collaboration being carried out, technical affordance of the wiki and the manifestation of that affordance as it's being perceived and utilized by the users.

Different collaboration will have different needs as it emphasized on different subsystem(s) of the activity. Some collaboration is more communication intensive, while others not so; it depends on the objective and tasks given to solve. Although wiki has multiple technical affordances, but only relevant ones were being perceived and utilized.

7.1.2 Learnings affords by the wiki

Looking at the learning activities, Bower et al. (2010) mentioned about the traditional affordance of a wiki, which is commonly used, such as in facilitating asynchronous representation of students' factual and conceptual knowledge reflecting what they had gained during their discourses. This was apparent in this study, particularly in the second case study where students reflected their experience of classroom teaching and shared to each other which leads to further reflective discourses. This shared documented wisdom emerged in the wiki and relevant to the participants beyond their semester.

Due to the similarity of tasks in the three case studies in this study, only limited pedagogical approaches were observable, and thus only limited learning affordances could be observed. However, it was apparent that the richness of the interactions was significantly influenced by the technical affordance of the wiki.

7.1.3 Perceiving the affordances & utilization

Students' perception of the affordances offered by a wiki and the subsequent utilisation of those affordances in group work collaboration, are significantly influenced by students' perception of the task at hand; their familiarity with the tool and the perceived value for them in using the tool. These are the factors related to the third question investigated by this study.

Students' perception of task and expectation of affordance

Perception of task directs the perception of affordance

This study re-emphasised the importance of individual students' perception about the objective of a learning task, an approach that confirmed the work of Kirkwood (2009). When a teacher gives instructions about a task, individual students will then form their own perception of what the teacher expects of them, and what is required to achieve the mark they desire. This perception is very important as it strongly determines the direction students will then follow as they carry out their learning activity. They assess the perceived task and gauge the amount of effort required, as well as the amount of support they might need to achieve their perceived learning goal.

Therefore, the students' perceptions of the learning task act like a *steering-wheel* which directs them to perceiving the affordance of the tool. For example, in this study, when the students were asked to share online resources, they instinctively looked for affordances relevant to the sharing of online resources. If the student's perception of sharing was to collect resources and give access to others to read those resources, rather than to interact and comment on each other's reflection, then they would look for ways to use the given tool to collect resources rather than to send messages. If they thought that the more resources they were to share the better the mark they would receive, then they would make the effort to collect as many resources as they possibly could to store in the tool.

Low expectation inhibits perception of affordance

Students' enthusiasm to use wiki influenced their ability to perceive the affordance of that particular tool. It motivated them to make the effort to perceive and utilise the affordance. When students had low expectations of the tool, whether due to their general pessimism about technology or a specific negative view about what the tool could do for them, then this hampered their ability to perceive a wider range of affordances.

Students' familiarity with the tool

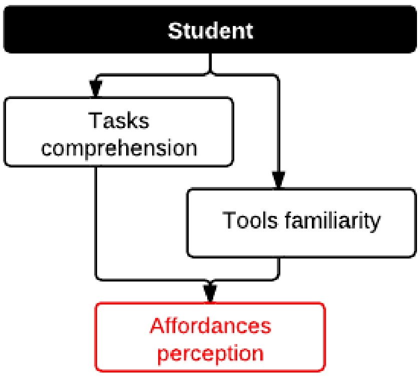


Figure 47 Factors influencing student's perception of affordance

Another factor that significantly contributed to the students' perception of affordance was their familiarity with the tool, a relationship which is depicted in Figure 47.

This study showed that familiarity with a tool is a strong factor that educators need to consider in order for technology to be adopted successfully in their classroom. Furthermore, familiarity could not be attained just by one or two demonstrations of features of the tools to the students. That said, it is possible for a student to operate the tool without actually knowing or becoming familiar with it; they can simply memorise the steps of the process to produce the same required output without grasping the deeper *technological knowledge* of the tool. However, students have the potential to discover for themselves' more innovative usages of the tool on their own if they have acquired some level of familiarity with it.

There are many constraints (educational, technical, and personal) that participants need to overcome before they can make effective use of the tools (Cole, 2009). The mantra, "If you build it they will use it" does not happen and is a point which this study argues against. There is a need for deliberate intervention on the part of academics to allow robust group work and to guide the discovery of the affordance using instructional scaffolding.

Thus Figure 47 summarises the two main factors that enable students to perceive the affordances of a tool: task comprehension and tool familiarity.

Students' valuation of content and engagement

The third contributing factor is the perceived value of the content to the students. This study indicated the significance of this as the underpinning motive for perceiving and discovering the affordances. Students were willing to experiment in using the tool beyond the stated learning objectives when they were enthusiastic about the content.

Value of content

(Engeström, 1999b) and (Victor. Kaptelinin & Nardi, 2006) noted that every activity starts with a motive, and motives exist as a result of seeking to satisfy needs. This study observed that when students were engaged in the learning activity, there was a strong drive and level of involvement because the learners felt that the content was relevant to them and that it satisfied their needs.

One respondent even described him/herself as being addicted to the learning activity, as he/she found intellectual satisfaction in doing it. Therefore, the step taken by the lecturer in the last case study to engage students with the content early in the learning activity was appropriate. The teacher started the assignment from a position of relevance, and then built up the students' level of engagement so that they were willing to invest more of their time in the process of exploration. Such a finding can help direct teachers in preparing students' learning when they have to introduce new technology into the learning process; by situating the content in contexts, they can trigger more enthusiastic responses from the students.

This finding also resonates with what Cole (2009) stated when she summarised her findings that participants do not have altruistic motives (for the benefit of others) when they decide their engagement with a collaborative task, and from that their use of the wiki tool. Participants gauge the usefulness of each tool from its perceived benefit to themselves first.

Value of peers

This study also revealed that students appreciated and valued highly the content that was generated through the contributions of the participants in their learning community. These community members shared the same interests and goals in their involvement in the learning activity. They also had a similar level of competency and mastery in terms of their content knowledge. Therefore, the students regarded their community as a filter that was effective in screening out unrelated material and that amplified the significance of related materials. Together, they acted as 'collective wisdom' to gather and screen information to share, organise and re-use. This mode of community-of-practice content was valued highly and (Goodnough et al., 2009) argued that such an approach helps improve learning in pre-service teacher education.

7.1.4 Academic's influence

The last question this study sought to look at was what influence academics have in inspiring the use of wiki for collaborative activities, particularly in imparting perceptions of affordance for collaboration and for transferring pedagogical and technical knowledge.

Imparting perceptions of affordance in collaboration

As mentioned in the literature review, students today no longer study primarily in isolation (Barkley et al., 2005; Bruffee, 1995; Dillenbourg, 1999; Engestrom, 2000; Engeström, 1999a; Hoppe, Ogata, and Soller, 2007; Jonassen and Land, 2000; K. Kuutti and Engeström, 2006; Lopez-Benavides and Alvarez-Valdivia, 2011; Matthews et al., 1995; Pea, 1994; Roberts, 2005). Instead, many of their learning processes are undertaken through collaboration and discourse. Thus, the tools being used are also no longer individual productivity tools, but collaborative tools.

Perception and discovery

As the study discovered, the adoption of technology in a technology-mediated collaborative learning context is a two-stage process. The first stage is the perception of affordance in the mind of an individual member of a learning community and the second stage is the *discovery* of that perceived affordance by the community as a collective to adopt and utilise the tool.

The results of this study are in line with the notion that affordance is a perception, that affordance perceptions formed by the actor as he/she interacts with the object within the environment (Gibson, 1979), which is the wiki. Therefore, the first step to promote an innovative use of the wiki is to stimulate the perception of the actor.

However, this study also supported Norman's notion of affordance, which is somewhat contradictory to Gibson's. Norman views affordance as the property of an object that is already embedded within the object and is waiting to be discovered (Norman, 1988). Through this study, it can be observed that it is not the individual who discovers the affordance, rather the collective or the community.

Both Gibson's and Norman's work were developed from the perspective of the individual actor. However, this study viewed the affordance as part of a tool-mediated social interaction. Hence, there is a distinction between the individual acting as an individual and the group of individuals acting as a single community.

As Stahl (2006) suggested, an individual has the intellectual capability to perceive, while a group as a unit does not. In this study, the phenomenon was observed whereby individuals did perceive affordance, but did not use it within the collaboration because the group did not realise the affordance, and thus was unable to utilise it. In other words, the group did not *discover* the affordance because the perception only resided within the enclosed mind of one or more individual members of the group. If the affordance had been discovered by the group, then the group would have had the opportunity to utilise it.

It can be argued that this distinction is not just semantics, but quite fundamental, because it suggests that to promote an affordance of a tool such as a wiki, educators do not necessarily have to 'inspire' all members of the group. Conversely, having only one member perceive the affordance is not enough to ensure that the particular affordance will be utilised by the whole group. As discussed previously in this chapter, this relationship between the individual and the group as a community occurs within an activity system where each learner can perceive an affordance according to his/her respective comprehension of the tasks and familiarity with the tools.

Tuckman's classic stages of group development are clearly in effect in this case. The team's dynamic develops from forming, storming, norming to performing; the norming stage is when the team starts to focus on the task and develop a certain intimacy between its members to allow personal opinions (such as individual perception of affordances) to be expressed and shared with the team (Finch, Lewis, & Turley, 2013; Tuckman, 1965). Academics have a significant role as they can influence this process.

The activity system provides the context for the different processes to take place, i.e. production, consumption, exchange and distribution. These processes were mediated by the wiki, limited by rules and values, and involved a coordination of labour to yield the artefacts that would lead to the learning outcome.

These findings illustrate the mechanism by which students perceived the affordances of the wiki to support their collaborative learning activity, and they are summarised and represented in Figure 48.

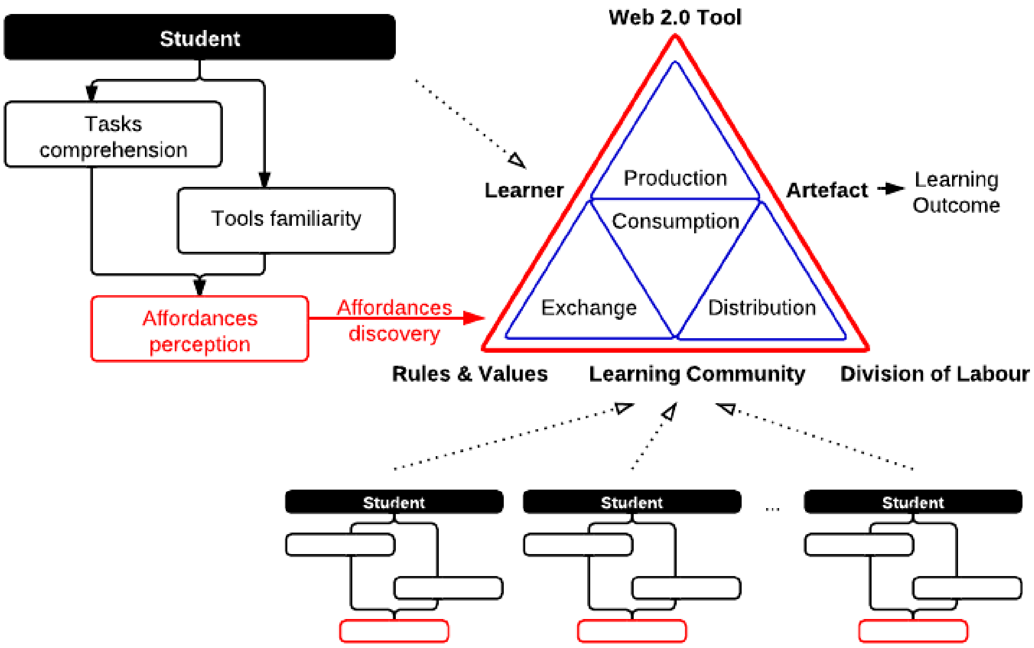


Figure 48 Two-stage affordance utilisation process in technology-mediated collaboration

Therefore, the study indicated that there is a need to encourage the group to discover and utilise the perceived affordance. Without any deliberate efforts or designed strategies to encourage group perception, we are likely to only observe pockets of accidental success.

Scaffolding experiences

Another key finding in this study is that successful prior experiences positively influence current experiences; 'positive' here means raising awareness of the existence of an affordance in a current situation. The influence of prior experience was not only *vertical* (related to the same affordance), but also *horizontal* (stimulated the perception of a new affordance); the former means that individuals who have experienced using a wiki for a particular use by utilising a particular affordance will tend to use the same affordance at other opportunities; while the latter means that past experience of using other Web 2 tools, for example, a blog, can make the individual a better wiki user. It is beneficial for students, therefore, if technologies are introduced gradually throughout their study program, to allow them to explore different affordances systematically and build up their familiarity with the affordances, not just with the tools. They would then be more likely to perceive affordances even when working with new and/or different tools.

The previous two discussions have significant implications for the way academics influence the use of collaborative tools in their teaching design. The two main factors, inspiring perception and building group work, are crucial to promote perception into the use of affordances.

It is not enough simply to provide technical training so that students know how to use the tool and its features. It is also even less satisfactory to simply provide the tool for the students and expect their "digital-nativeness" to figure out for themselves how to use them. Although pockets of success can occur in such circumstances, a deliberate and scaffolded approach to building confidence and mastery needs to be embedded into the unit design or even across multiple units. Concepts such as embedded literacy can be expanded into digital learning literacy, which is useful beyond the formal degree.

The relationship between the academics' roles, the students' roles and technology-mediated collaboration can be conceptually depicted, as in Figure 49.

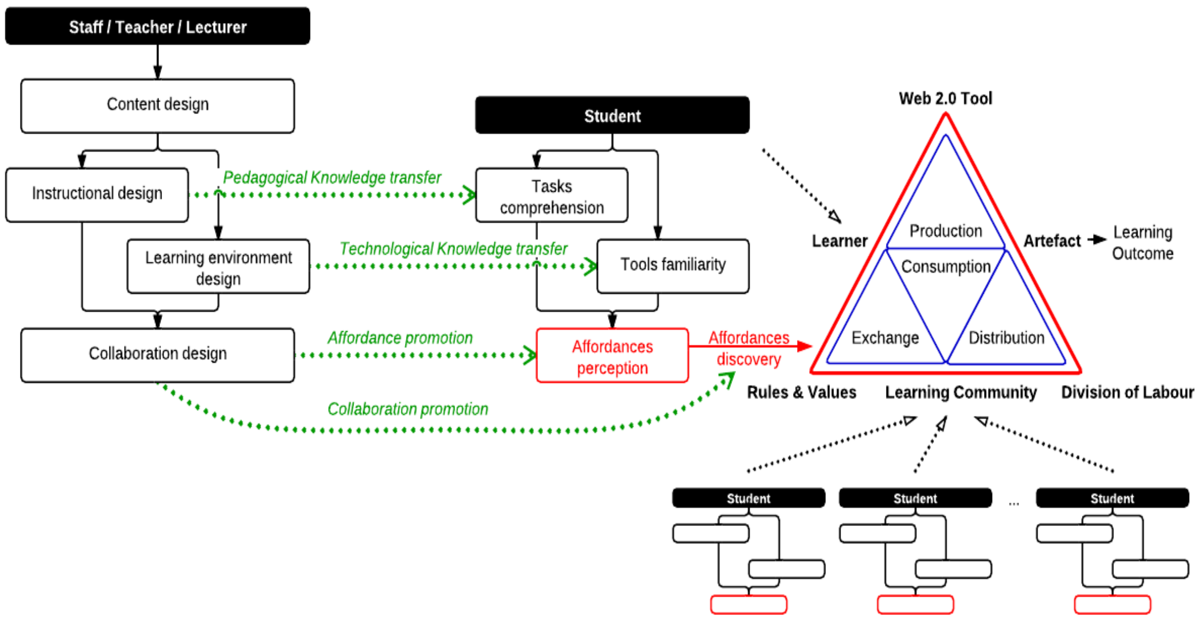


Figure 49 Ecosystem of technology-mediated collaboration

Students engage in a learning activity with a learning community consisting of other students, while academics influence individual students; the results indicate that post-design, once the unit is running, teachers still have many opportunities to take an active role in influencing individual students and eventually the whole group.

The influences can be classified into two, namely, transfers and promotions:

Pedagogical & Technical knowledge Transfers

Pedagogical knowledge transfer

To ensure proper comprehension of the expected tasks and performance of students, academics can influence students through effective transfer of their pedagogical knowledge. By transfer it is meant the transfer of understanding about the instruction, expected deliverable from the lessons and the envisioned management of student learning on the particular topic (Mishra and Koehler, 2006).

This knowledge is not something new to academics, and it requires consistent reinforcing throughout the learning activity; not just something that academics prepare when designing the unit or at the beginning of a semester.

In relation to Web 2.0-enabled collaboration, this transfer strongly influences the perception formed in students' minds about what affordances are required to support their collaboration. The findings indicated that students will use the tools to address those needs; their understanding of the tasks can constrain their ability to identify and match affordances and needs. If the tasks themselves are not properly comprehended, then it is unlikely that students can see the need for technology, or they might have false perceptions/needs.

The academics 'effectiveness in facilitating students' understanding of the tasks and the processes required to complete those tasks will influence the students' ability to perceive the affordances of the tool to be used.

Technological knowledge transfer

To assist students become familiar with the technology, academics have a role in designing the Web 2.0 learning environment in ways that allow for gradual development in student engagement. Depending on the students' familiarity with the technology in general and the particular Web 2.0 tool being used (e.g. a wiki), a teacher needs to be an active agent who adjusts and tweaks the learning environment to accommodate the nurturing of students' familiarity with the tools and the building of confidence in their use.

To again use the language that (Mishra and Koehler, 2006) used, this is the technological knowledge transfer from the teacher to the students. This does not mean that the teacher has to know everything to *out-smart* the student; however, the teacher has to become him or herself a confident user of the technology for their own learning and to envisage how students can build their familiarity with the tool. This study has shown that such imparting of confidence is crucial in positively influencing the perception of affordances by students, which in turn can encourage the perceiving students to influence their group to discover the affordance and thence make effective use of the tool.

There is no single right way to approach both pedagogical and knowledge transfers. This study found that different cohorts of students had different strengths, weaknesses and needs which required different transfer approaches. The transfers, therefore, need to be an ongoing negotiation between what the academic perceives and does to support students, and what the students perceive and do in response to the academic's instruction. These negotiation and re-negotiation processes resemble the conversation processes between teacher and students that Laurillard conceptualised in her conversational framework (Laurillard, 2002) and are a real influence that academics can bring to the degree to which an individual and/or a group can perceive the affordance of the tool.

Promoting affordance & collaboration

As mentioned before, the study indicated that academics need to take an active role in promoting to students' technology usage in collaborative activities. This is not simply instructing students in how to use the features of the tools, but more on how to use the tool meaningfully in context.

To be effective in this regard, academics needs both to encourage the individual student's perception of affordances and to facilitate the development of positive group dynamics which in turn allows the discovery of those perceived affordances.

When promoting individual perception, academics can direct attention one student at a time, since perception is built individually, although not in isolation. Each student is influenced by his or her unique background and level of familiarity in using the tool. Approaches such as *discovery learning* or *guided discovery* and *coaching* can be applied at this stage.

A more holistic approach is needed to promote those individual perceptions into collective discovery. This study indicated that students were hesitant to share when they feared being seen to be fallible or they were concerned about being viewed as disrespectful by commenting on others' contributions.

These factors can cause the perceived affordances to remain undiscovered by the group, as this study has revealed.

7.2 Suggestions for future work

7.2.1 Teachers' perspective

This study focussed on the student's perspective and explored how students interacted with the Web 2.0 tools and with each other in their tool-mediated learning activities. It also focussed on how the students reflected on their experience, as well as looked into what the tools had enabled them to do. The role of the teacher was extrapolated from the experiences of students; however, more research is necessary to fully explain the teachers' role in the activity. One approach to such a study would be to involve a number of teachers from a similar teaching field of study.

7.2.2 Diversity of Web 2.0 tools

Further practical work can be done to utilise the framework presented in this study to closely examine the various suggested uses of Web 2.0 tools for collaborative learning (Bower et al., 2010; Mason and Rennie, 2008a). It can also be used to reveal the underpinning affordance that supports pedagogical approaches. This would allow educators and those responsible for supporting them to make a more conscious decision when selecting what technology to invest into achieve identified outcomes.

7.2.3 Discovery process

Future work can also be done towards having a closer look at the phenomenon of affordance discovery and what factors influence the effectiveness of such discovery. The findings from such a study may raise awareness and better inform educators of the relevant factors that can assist when promoting perception of technological affordance in a technology-mediated collaboration.

7.2.4 Psychological aspect of motivation

Future theoretical work can also be done to expand the framework to include psychological aspects, a topic that has not been thoroughly discussed in this study. Such expansion of the framework would open the discussion about motive and development of motive in relation to the need for the activity. It would also explore the intrinsic factors that hamper the perception and use of affordances, such as the issue of self-confidence in presenting one's own unfinished work to the public (Cole, 2009)

Further work in this area would be useful in understanding how students' internal driving forces can be harvested to improve engagement in collaborative learning activity. A study that could develop a hierarchical need similar to Abraham Maslow's work on human motives, but that is developed for a tool-mediated collaborative learning activity with design indicators that an educator can use would be profoundly useful.

7.3 Conclusion

Although the adoption of Web 2.0 technology in collaborative learning is both unavoidable and exciting, it can serve to improve students' learning only relative to the way in which it is used. This study sought to contribute, and has contributed, to the literature to help educators take another step towards the practical use of activity theory and conceptualisation of affordance in collaborative learning activity.

The framework depicted in Figure 49 can be used by teachers, including the pre-service teachers involved in Case 2 and Case 3, as a practical guide to conceptualize the roles of students and teachers when engaging in Web 2.0 tools mediated collaborative learning, and also has made a major theoretical contribution to the literature on activity theory, conceptualisation of affordance and collaborative learning in a technology-rich environment.

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9 Appendix A: Research Instruments

Questionnaire

The questionnaire was designed with two parts, the Likert scale (Table 23) was used to rate the participants' perceptions towards several statements in regards to collaboration in general and collaboration through means of technology.

Table 23. Questionnaire: Likert Scale Questions

Qn 1	I found it easy to use the tools to complete the workshop activities
Qn 2	I need other additional tools to complete the workshop activities
Qn 3	With my peers, I value their contribution to my own work.
Qn 4	With my peers, I can contribute to improve his/her work.
Qn 5	I would not have been able to collaborate with my peers as effectively as I did without the support of the tools.
Qn 6	I found it efficient to use the tools to share the documents I have produced with others.
Qn 7	I used different tools to communicate with my peers at different stages of our work.
Qn 8	I found that the tools we used influenced the way I communicate and work with my peers.
Qn 9	I found that the tools are very useful for me to share the workload with my peers.
Qn 10	I prefer to coordinate work with my peers through the use of the tools rather than manually.
Qn 11	I have used some or all of the tools in another unit before.
Qn 12	I have used some or all of the tools for social purposes before.
Qn 13	I can always substitute the role of the supporting tools with a manual process.

And the second part (Table 24) is the open-ended response from participants to allow a greater opportunity to explain in detail their reflection and to make some points clearer.

Table 24. Questionnaire: Reflection open-ended questions

Qn 14	What main tool did you use for collaboration? And what aspects of that tool did you find easy to use? What aspects were difficult?
Qn 15	What additional tools did you use to support your effort to produce the deliverable in the activity? And why do you choose to use those tools in addition to / to replace the tools provided?

Qn 16	How did your group go about working together on a single task?
Qn 17	How did your group go about dividing and assigning responsibilities?
Qn 18	How would you describe your team's collaboration?
Qn 19	How do you see the value of the tool in general? And the wiki in particular? What would you define as effective?
Qn 20	From your perspective, what kind of sharing do you seek in collaborative group work? How did the wiki and other tools support those needs?
Qn 21	How much do you value the tools? And what was your perception of the role of the tools in supporting the team's collaboration?
Qn 22	Did some of your group members form a preference over a communication method which was different from the rest of the group? If so, please explain.
Qn 23	Did you make any adjustment in your communication style and your attitude towards group work after using the tools? What adjustment was made? And why do you feel you needed to make the adjustment?
Qn 24	For each tool you used can you identify if you have used them for learning purposes, for social purposes, or both, and whether each is appropriate for such use or not.

Student interview

The interview was conducted as a semi structured interview, with several guiding questions as seen in Table 25. The allotted time for each interview of 20 minutes per session; and the interview sessions were scheduled as part of the regular class schedule of the unit.

Table 25. Interview guiding questions (Students)

IS#	Guiding questions
01	What aspect of the tools did you find easy to use? What aspects were difficult?
02	What additional tools did you use to support your effort to produce the project documents? And why did you choose to use those tools in addition to / to replace the tools provided?
03	How did you and your peers go about working together on a single task?
04	How did you and your peers go about dividing and assigning the responsibility/roles?
05	How would you describe you and your peer's collaboration?
06	How would you see the value of the tool in general? And the tools in particular? What would you define as effective?
07	What kind of sharing is sought after and valued from your perspective? How did the tools support those needs?

08	How much do you value the tools? And what was your perception of the role of the tools in supporting collaboration?
09	Did the sub-group formed out of communication preferences? What tools caused this division?
10	Did you make any adjustment in your communication style and your attitude towards group work after using the tools? What adjustment was made? And why do you feel you needed to make this adjustment?
11	How familiar are you with the tools within a social and formal learning context?

Teacher Interview

Teachers were interviewed in a semi structured interview with guiding questions shown in Table 26. The semi structured interview was conducted after the end of the last semester.

Table 26. Interview Guiding Questions (Teachers)

IT#	Guiding questions
01	How do you expect the tools will support student's learning in this unit?
02	What feature(s) of the tools appeal to you?
03	What other tools were considered before you made your decision to use the tools? And why did you decide to use the tools?
04	How would you see the use of tools changes the way the students interact with each other? And with you?
05	How familiar are you with Web 2.0?

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10 Appendix B: A framework for Web 2.0 learning design

Bower, M., Hedberg, J. G., & Kuswara, A. (2010). A framework for Web 2.0 learning design. *Educational Media International, 47*(3), 177 - 198.

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A framework for Web 2.0 learning design

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This paper describes an approach to conceptualising and performing Web 2.0-enabled learning design. Based on the Technological, Pedagogical and Content Knowledge model of educational practice, the approach conceptualises Web 2.0 learning design by relating Anderson and Krathwohl's Taxonomy of Learning, Teaching and Assessing, and different types of constructive and negotiated pedagogies to a range of contemporary Web 2.0-based learning technologies. The learning design process can then be based upon the extent to which different Web 2.0 technologies support the content, pedagogical, modality and synchronicity requirements of the learning tasks. The model is resilient to the emergence of new Web 2.0 tools, as it views technology as only a mediator of pedagogy and content with attributes to fulfil the needs of the learning episode. A range of possible use cases, categorisations and examples are offered to illustrate the learning design concepts and processes, in order to promote more savvy and expedient application of Web 2.0 technologies in learning and teaching contexts.

Ein Rahmen für Web 2.0-Learning-Design

Dieses Papier beschreibt einen Ansatz für die Konzipierung und das Ausführen von Web-2.0-aktiviertem Learning Design. Auf der Grundlage des technologischen und pädagogischen Wissens und dem Content Knowledge-Modell der Bildungspraxis wurde der Ansatz des Web 2.0 Learning Design im Zusammenhang mit Anderson und Krathwohl's Taxonomie des Lernens, Lehrens und Bewertens konzipiert, und verschiedene Arten von konstruierten und ausgehandelten pädagogischen Ansätzen zu einer Reihe von modernen Web-2.0-basierte Lern-Technologien berücksichtigt. Der Learning-Design Prozess kann dann auf dem Umfang, die verschiedenen Web 2.0-Technologien, dem pädagogischen Content, der Modalität und Synchronizität. die die Anforderungen der Lernaufgaben unterstützen, basieren. Das Modell ist offen für die Anforderungen der neuen Web 2.0-Tools, soweit es Technologie nur als Vermittler der Pädagogik und Inhalte der Bedürfnisse der Learning-Episode zu erfüllen hat. Eine Reihe von möglichen Anwendungsfällen, Kategorisierungen und Beispielen werden angeboten, um das Lernen zu illustrieren und das Entwerfen von Konzepten und Prozessen zu unterstützen und um weitere spezielle und ratsame Anwendungen der Web 2.0-Technologien in den Kontexten Lehren und Lernen zu fördern.

Un cadre pour la conception d'un apprentisage en Web 2.0

Cet article décrit une façon de conceptualiser et de réaliser la conception d'apprentissages reposant sur la Web 2.0. En s'appuyant sur les modèles de

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pratique éducative fondés respectivement sur les connaissances technologiques, les connaissances pédagogiques et les connaissances du contenu, cette approche théorise la conception d'apprentissages de la Web 2.0 en reliant la Taxonomie de l'Apprentissage, l'Enseigner et Evaluer d'Anderson et Krathwohl ainsi que différents types de pédagogies constructives et négociées à une gamme de technologies d'apprentissage contemporaines fondées sur le Web 2.0. Le processus de conception de l'apprentissage peut alors se baser sur la mesure où différentes technologies de la Web 2.0 répondent aux exigences pédagogiques, de modalité et de synchronicité des tâches d'apprentissage. Ce modèle résiste à l'émergence de nouveaux outils Web 2.0 du fait qu'il considère la technologie seulement comme une médiatrice de la pédagogie et du contenu avec des attributs servant à répondre aux besoins de tel ou tel épisode d'apprentissage. Une gamme de cas d'usages possibles, des catégorisations et des exemples sont présentés pour illustrer les concepts et processus de la conception des cours, ceci afin de mettre en avant une application plus subtile des technologies Web 2.0 dans des contextes d'apprentissage et d'enseignement.

Un marco referencial para el diseño de aprendizaje en la Web 2.0

El presente artículo describe una aproximación a la conceptualización y realización del diseño de un aprendizaje basado en la Web 2.0. Apoyandose en los modelos de práctica educativa fundados en Conocimientos Tecnológicos, Conocimientos Pedagógicos y Conocimientos de Contenidos la presenta aproximación conceptualiza el diseño de aprendizaje en la Web 2.0 conectando la taxonomía del aprendizaje, enseñanza y evaluación de Anderson y Krathwohl así como varios tipos de pedagogías constructivistas y negociadas con una gama de tecnologías de aprendizaje contemporáneas basadas en la Web 2.0. El proceso de diseño del aprendizaje puede entonces basarse sobre la medida en que varias metodologías de la Web 2.0 satisfacen las exigencias de contenido, pedagogía, modalidad y sincronicidad de las tareas de aprendizaje. El modelo está resiliente a la emergencia de las nuevas herramientas Web 2.0 en la medida en que se considera la tecnología solamente como un mediador de tecnología y contenido con atributos que permiten cumplir con las necesidades de tal o tal episodio de aprendizaje. Se ofrece una gama de casos de usos posibles, de clasificaciones y ejemplos para ilustrar los conceptos y procesos de diseño del aprendizaje y por ende fomentar una aplicación más sutil y expediente de las tecnologías de la Web 2.0 en contextos de aprendizaje y enseñanza.

Keywords: Web 2.0; learning design; pedagogy; tasks; technology

Learning design and Web 2.0

There has been an explosion in the number of Web 2.0 tools available for educators to use with their students. The open, collaborative and contribution-based nature of the Web 2.0 paradigm and its associated tools holds great promise for the future of education – it appears that there is finally accord between the design of technology and the student-centred, interactive approaches being advocated by contemporary educational theory. The online nature of these tools and the new paradigms they facilitate enhances the possibilities available for distance education. So powerful are the potentials of Web 2.0 tools that they are often being used in face-to-face classes (Redecker, Ala-Mutka, Bacigalupo, Ferrari, & Punie, 2009). However, with such a variety of tools continually emerging it can be difficult for teachers to keep pace with the technologies at their disposal, let alone conceptualise them into a schema for application.

It is somewhat difficult to reach consensus over what is meant by "Web 2.0" because rather than having a hard boundary, the term "Web 2.0" has more of a gravitational core (O'Reilly, 2005). Alexander (2006) points out that ultimately the label is far less important than the concepts, projects and practices it incorporates which include:

- *social software* – where multiple users can collaborate with one another and contribute to the authorship of content;
- *micro-content* – blog posts, text-chats, video clips, rather than monolithic compositions;
- *open* – these tools and the often massive amounts of user generated content that they create and organise are characterised by being freely available on the web; and
- *sophisticated interfaces* – using AJAX, XML, RSS, CSS to create drag and drop, semantic, extensible and aesthetically pleasing website designs that can provide notification of changes.

Among the number of Web 2.0 tools, the educational field is still searching for frameworks for thinking about how to design learning experiences using Web 2.0 technologies. "Learning design" can be used to describe the "learners and a space where they act with tools and devices to collect and interpret information through a process of interaction with others" (Oliver, Harper, Wills, Agostinho, & Hedberg, 2007, p. 65). However, a recent (July 2010) search of the Educational Resource Information Center (US Department of Education, 2009) using the terms "Web 2.0" and "learning design" returned only three results. Bensona and Samarawickrema (2009) describe how different types of blended learning contexts can be supported by different levels of dialog, autonomy and structure, but make only passing reference to the sorts of online technologies that support these different types of contexts. Conole and Culver (2009) report on a Cloudworks tool that supports the sharing of learning designs between teachers, but does not provide recommendations about learning design using Web 2.0 tools. Greener (2009) discussed issues relating to learning design and Web 2.0 tools such as blogs and wikis, but did not present a framework to support design. This indicates a scarcity of work specifically relating to Web 2.0-enabled learning design.

It should be noted that there has been a great deal of commentary about Web 2.0 and many examples of its use (for instance, see Alexander, 2006; Downes, 2005; or the *Computers in the Schools* special issue on Web 2.0 in Education, Issues 3 & 4, 2010). Based on over 280 cases, Redecker et al. (2009) provide an excellent report on the impact of Web 2.0 innovations on education and training in Europe. Their review provides examples of ways in which Web 2.0 tools can be used to enable new models of collaboration, personalise learning pathways, promote diversity and take advantage of a societal context (Redecker et al., 2009). However, there is very little work that examines how educators might make sense of the wide range of Web 2.0 tools available in the context of learning design, so that they can appropriately select and apply Web 2.0 tools that match the learning requirements of their curriculum.

As far as defining the sorts of knowledge and skills that teachers require in order to implement technology-based learning designs successfully, Mishra and Koehler (2006) present a Technological Pedagogical and Content Knowledge (TPACK) model (Figure 1).

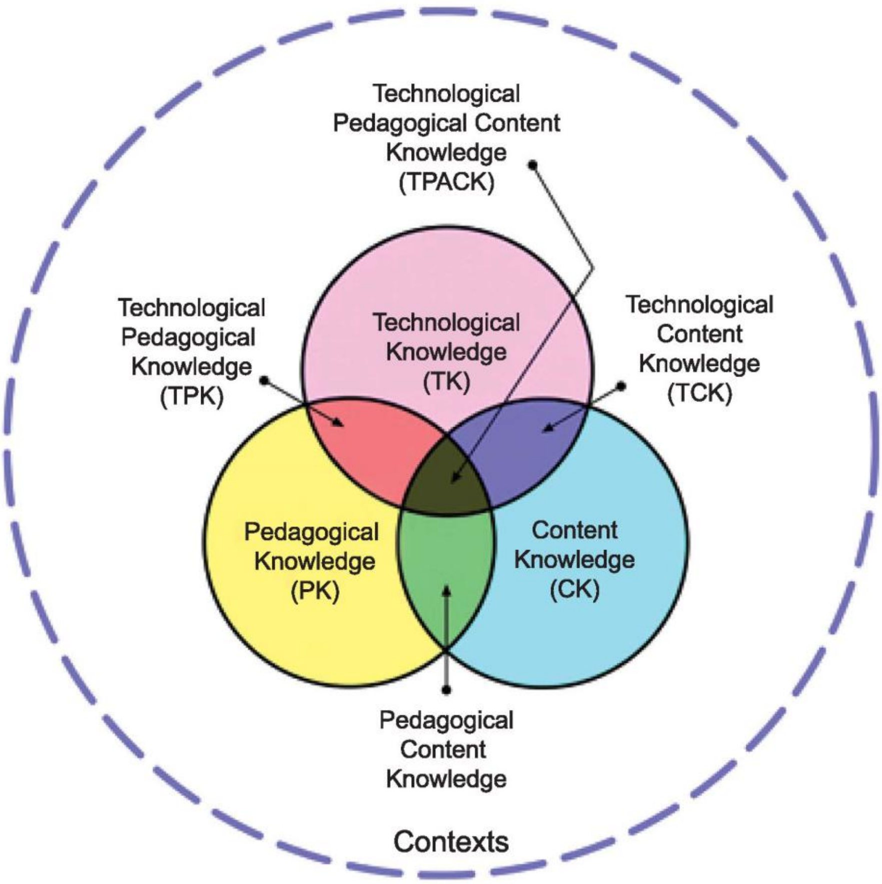

Figure 1. The TPACK (Technological Pedagogical and Content Knowledge) model of educational practice. Reproduced with kind permission of *Teachers College Record*.

The TPACK approach emphasises the importance of the intersections between Technological Knowledge, Pedagogical Knowledge and Content Knowledge, and proposes that effective integration of technology into the curriculum requires a sensitive understanding of the dynamic relationship between all three components. Insofar as it addresses the content, pedagogy and technology elements of educational practice, the TPACK model can be used as a foundation for analysing learning design employing Web 2.0 tools. In particular and for the purposes of this paper:

- the content is the discipline specific knowledge that the learning design will address;
- the pedagogies are the types of interactive approaches that the learning design attempts to engage, based on the their intended level of narrative and construction they entail; and
- the technologies are Web 2.0 tools with their social emphasis, micro-content orientation, open access and sophisticated interfaces.

This paper provides an integrated framework for conceptualising and performing Web 2.0 learning design based upon Anderson and Krathwohl's (2001) Taxonomy of Learning, Teaching and Assessing as well as different types of negotiated and productive pedagogies. Based on this conceptualisation, a range of considerations are identified to support the matching of Web 2.0 tools to learning requirements. Two examples are provided to illustrate how the requirements of the task and the conceptualisations presented can be used to select and create Web 2.0 learning designs in order to meet learning and teaching needs.

Online content and their tasks

Critical to the use of technology in education is the realisation that the technology is simply the mediator for collaboration and representation, and that it is the type of task and thinking processes in which students engage that determines the quality of learning. Thus it is useful for educators to start with the types of thinking and processes with which students are required to engage before identifying technologies that will best facilitate them. Anderson and Krathwohl's (2001) Taxonomy of Learning, Teaching and Assessing provides a framework for conceptualising learning that incorporates a Knowledge dimension and Cognitive Process dimension. Using Anderson and Krathwohl's (2001) taxonomy not only enables a more context-free model to be formed but also the model to retail a focus on the learning rather than the technology.

The Knowledge dimension of Anderson and Krathwohl's (2001) taxonomy relate to the sorts of subject matter content being addressed and incorporates the following categories (Anderson & Krathwohl, 2001, pp. 27–29):

(1) Factual knowledge – discrete pieces of elementary information, required if people are to be acquainted with a discipline and solve problems within it;
(2) Conceptual knowledge – interrelated representations of more complex knowledge forms, including schemas, categorisation hierarchies, and explanations;
(3) Procedural knowledge – the skills to perform processes, to execute algorithms and to know the criteria for their appropriate application; and
(4) Metacognitive knowledge – knowledge and awareness of one's own cognition as well as that of other people.

The levels of the Cognitive Process dimension of Anderson and Krathwohl's (2001) model include Remembering, Understanding, Applying, Analysing, Evaluating and Creating, which represents a refinement of Bloom's (1956) Taxonomy. These represent a continuum from lower-order thinking skills to higher-order thinking skills, with lower level thinking capacities being a necessary prerequisite for corresponding higher-order thinking skills to occur. Anderson and Krathwohl's (2001) model outlines a number of sub-processes that comprise each level, and Churches (2008) has extended these to incorporate the sorts of cognitive processes that specifically relate to digital learning (Churches' additional digital processes listed in italics):

- **Remembering** – recognising, listing, describing, identifying, retrieving, naming, locating, finding, *bullet pointing, highlighting, bookmarking, social networking, social bookmarking, favouriting/local bookmarking, searching, Googling;*

- **Understanding** – interpreting, summarising, inferring, paraphrasing, classifying, comparing, explaining, exemplifying, *advanced searching, blog journaling, twittering, categorising, commenting, annotating, subscribing*;
- **Applying** – implementing, carrying out, using, executing, *running, loading, playing, operating, hacking, uploading, sharing, editing*;
- **Analysing** – comparing, organising, deconstructing, attributing, outlining, finding, structuring, integrating, *mashing, linking, tagging, validating, reverse-engineering, cracking*;
- **Evaluating** – checking, hypothesising, critiquing, experimenting, judging, testing, detecting, monitoring, *blog/vlog commenting, reviewing, posting, moderating, collaborating, networking, refactoring, alpha/beta testing*; and
- **Creating** – designing, constructing, planning, producing, inventing, devising, making, *programming, filming, animating, blogging, video blogging, mixing, remixing, wiki-ing, publishing, videocasting, podcasting, directing/producing.*

Note that each of these processes (or "verbs") are generalisations, and the extent to which they actually engage the level of thinking of the Cognitive Process category depends on the task itself and the students' level of cognitive engagement with it. Also, while Churches' (2008) work does relate thinking processes to digital technologies, it does not provide a means of relate these processes to the types of pedagogies that learning designs may apply to achieve the intended discipline learning outcomes.

Online pedagogies

There are many different aspects of pedagogy that can play a determining role in the success of a learning episode, including an understanding of how to cater to the target audience, how to specify tasks clearly and how to develop a positive learning environment (Mishra & Koehler, 2006). However, many of these sorts of pedagogical considerations relate more to the specific context within which learning is occurring, so in terms of developing a generally applicable framework the degree of negotiation and production that learning designs apply will be used, as follows:

- *Transmissive* – transmission-based information delivery approaches, where a stream of information is broadcast to learners;
- *Dialogic* – centred on discourse between participants, and often involving exemplars followed by periods of activity and feedback;
- *Constructionist* – where learning occurs by developing a product; and
- *Co-constructive* – groups of learners complete a series of goal-related tasks to produce an artefact.

There are merits to each learning activity design, depending on the stage of the learning cycle. For instance, direct instruction approaches are considered by some to be more appropriate when students are yet to form understandings about a particular topic (Magliaro, Lockee, & Burton, 2005). One espoused instructional approach is for developing student capacity in a domain is expert modelling, whereby a teacher demonstrates a to-be-learned process, which thereby offering students a "cognitive apprenticeship" (Collins, Brown, & Holum, 1991). This allows teachers to not only impart directly subject matter knowledge but also attitudes, thought processes, problem-solving techniques and a whole range of other underlying techniques. However, transmissive approaches generally do not take maximum advantage of the benefits derived from more socio-constructivist learning designs, including the active engagement of students, support from peers and the ability socially to construct meaning (Hedberg, 2003; Jonassen, 2000; Land & Hannafin, 2000).

Dialogic pedagogies allow students to extend beyond what they could have achieved in isolation to learn in their Zone of Proximal Development (Vygotsky, 1978). Laurillard (2002) presents a comprehensive Conversational Framework for dialogic learning using technology. According to this model, learners form complete understanding by apprehending the structure of discourses, interpret forms of representation, act on descriptions of the world, apply feedback and reflect upon the goal–action–feedback cycle. Critically, the model highlights the importance of discursive (conversational) flows to enable these processes to occur. Empirical evidence shows that conversational approaches can improve student learning; Waite, Jackson, and Diwan (2003) describe how transforming the classroom into a more conversational environment (both between students and with the teacher) led to a doubling of the percentage of A grades that students received in a distributed systems course.

Constructionist pedagogy was first described by Seymour Papert (1986), whereby students learn by reconstruction rather than as a transmission of knowledge, and assumes that learning is most effective when students are constructing a meaningful product. Inspired by constructivist learning theory, constructionism is argued to improve learning by virtue of engaging participants in personally meaningful productive pursuits over which they exercise a large degree of control (Willett, 2007). Clements (2009) describes virtual constructionism as "understanding the relationship between teaching and student learning, and integrating it effectively with e-learning technologies to support students in constructing meaningful experiences". Thus to apply virtual constructionist approaches requires an understanding of which tools afford production and creation.

Co-constructive pedagogies place responsibility for production on groups of learners so that they can benefit from both the peer-assisted elements of dialogic pedagogies as well as the productive component of constructionist pedagogies. While there can be process losses incurred by attempting to coordinate such activity online (Neale, Carroll, & Rosson, 2004), the intention is that with savvy learning design the benefits of social interaction (Mayer, 2005) and more active participation (Willett, 2007) outweigh any extra collaborative overhead experienced by collaborating online. These pedagogies can be distinguished by their degree of negotiation and production, as shown in Table 1.

Note that the definitions above do not define the particular role of the teacher or students; it is possible that students could be applying more instructional approaches by creating presentational materials for their peers, or that the teacher could be part of a co-constructive pedagogy. In terms of technology selection for the online pedagogy, the important element is the way in which all participants interact.

Table 1. Pedagogies categorised according to their degree of negotiation and production.

	Non-negotiated	Negotiated
No product	Transmissive	Dialogic
Product	Constructionist	Co-constructionist

One final dimension that determines the nature of pedagogy applied is the temporal organisation of activity, either synchronous or asynchronous. Synchronous activities enable instant access to feedback and troubleshooting support. Asynchronous activities allow anywhere anytime access and provide students more time for reflective thinking. The type of interaction required will influence the technology that is selected for the task. The next section discusses the types of Web 2.0 technologies available to educators, with respect to the types of online content they can represent and the type of activity they facilitate.

Web 2.0 technologies

There is a vast range of Web 2.0 technologies at the educators' disposal. The ever-expanding number and type of technologies makes it practically impossible to describe the field. However, the list below, while not claiming to be exhaustive, attempts to provide a summary of the types of Web 2.0 technologies currently available and the potential they afford for representing content and facilitating collaboration. Distinguishing characteristics of these tools are the modalities of representation (text, image, audio, video) that they incorporate and the degree of synchronicity they enable.

Social bookmarking

Social bookmarking sites such as Delicious (http://delicious.com) and Simpy (http://www.simpy.com) allow communities of practice to save and exchange their favourite websites. Systems such as iCite (http://www.icyte.com) enable users to archive previous versions of pages irrespective of whether they have changed. Not only does social bookmarking allow people to store their bookmarked sites online for anytime anywhere access but systems such as Diigo (http://www.diigo.com) allow for the creation of groups so that people can build a collective information repository. The approach also allows users to find people of common interests and form collaborative networks. Essentially these tools promote the recall, identification and exchange of factual information, although their community-building features can sometimes be used to facilitate discourse. Sharing of links and information is predominately text-based.

Wikis

Collaborative authoring has been one of the most popular uses of Web 2.0 technologies as is evidenced by the hugely successful Wikipedia. Based on the Mediawiki technology, the site has over 75000 active contributors who have created more than 13 million articles in over than 260 languages and attracts over 65 million visitors a month (http://en.wikipedia.org/wiki/Wikipedia:About). However, there are hundreds of wiki tools available for use (for instance, http://www.wikimatrix.org allows visitors to compare the features of over 120 wikis). Many of these are served and freely available for use, such as PBworks (previously PBwiki, http://pbworks.com/academic.wiki), Wetpaint (http://www.wetpaint.com) and Wikispaces (http://www.wikispaces.com). Contributions were traditionally limited to text and image, though embedding of audio and video is now more common. These wikis allow educators to not only organise and interrelate conceptual information for their students, but more importantly allow students to co-construct knowledge.

Shared document creation

At the document level tools such as Google Docs (http://docs.google.com) and Buzzword (http://buzzword.acrobat.com) allow users in different locations to access the same file and edit and comment it in much the same way as for a Microsoft Word document. For more smaller and simpler applications, Writeboard (http://www.writeboard.com) allows users to author collaboratively through a text field but still provides a comprehensive change tracking system. Google Wave (http://wave.google.com) allows participants to synchronously hold text-chat conversations while they edit documents containing richly formatted text, photos, videos and so on. The synchronous document, text and audio sharing capabilities of web-conferencing systems such as Dim Dim (http://www.dimdim.com) and WizIQ (http://www.wiziq.com) also facilitate effective collaborative authoring of documents. All of these shared document creation tools have obvious application for the collaborative authorship of teacher documents and student projects, but also offer a logical means for teachers to provide students with formative feedback and support on their assignments (i.e., supports negotiation).

Blogs

The ease with which blogs allow individuals or consortiums to post, sequence and organise information on the web has led to their rapid application in a variety of contexts. Educationally speaking, blogging tools such Blogger (http://www.blogger.com), Edublogs (http://edublogs.org) and Wordpress (http://wordpress.com) enable students and teachers to publish their experiences and reflections, providing insight into their thoughts and practices. The capacity for filtered comments to be placed on blogs facilitates negotiated learning approaches. Text and image representation are standard blogging modalities. Blogging tools such as Glogster (http://www.glogster.com) and Scrapblog (http://www.scrapblog.com) provide an interface that allows students to be more creative in the way they use multimedia to express their ideas, thus supporting a wider range of content representation. Because blogs sequence posts chronologically in much the same way as a diary, they are often used for reflecting thinking, which in turn makes them suitable for metacognitive tasks. Some of the most successful uses of blogs for teaching and learning relate to the creation of classroom blogs so that students collaboratively form and reify their understandings. Pertinent examples of this include Podkids Australia (http://www.podkids.com.au), Kingsford Smith School blog (http://kssvideo.wordpress.com) and Wormbins (http://wormbins.edublogs.org).

Microblogging

A recent use of Web 2.0 to collaborate is the use of text-based microblogging tools such as Twitter (http://www.twitter.com), Jaiku (http://www.jaiku.com) or Identica (http://identi.ca) to enable real-time communication and tracking of events. Not only useful for Hollywood celebrities and politicians instantaneously and immediately to reach out to the public without fear of being spammed (you choose who you follow, not who follows you), microblogging tools afford real potentials for teaching and learning. At the EDMEDIA2009 conference, Twitter was used for all conference participants to collaborate about the keynotes and sessions they were attending, enabling an informative and often provocative subtext to occur. Similarly, microblogging tools can be used in class to coordinate activity, document an event or follow a live-feed for an event in progress (be it locally or on the other side of the world). These tools obviously support dialogic approaches; however, the 140-character limit placed on contributions means that the knowledge exchanged is largely factual in nature. The recent emergence of more multimedia-oriented microblogging tools such as Coveritlive (http://www.coveritlive.com) and Plurk (http://www.plurk.com) expands the amount and type of knowledge that can be shared through these dialogic processes.

Presentation tools

There has been criticism of the way traditional presentation tools such as Microsoft Powerpoint and Apple's Keynote have been used to help audiences form understanding (McKenzie, 2000). Yet these tools have been the mainstay of presentation practices for most educators because until recently there was a paucity of viable alternatives, but now tools such as CoolIris (http://www.cooliris.com) and Prezi (http://prezi.com) allow for the nonlinear organisation of information that can be naturally navigated in multiple directions and at a variety of scales. This means that students as well as teachers can start to restructure information in ways that more accurately represents the relationships between the component concepts. At the same time, tools such as Slideshare (http://www.slideshare.net), Authorstream (http://www.authorstream.com) and Vcasmo (http://www.vcasmo.com) enable the online distribution of multimedia presentations, breaking down the temporal and institutional barriers that have traditionally constrained the dissemination of such resources.

Image creation and editing

Images afford the persistent illustration of the relationship between several elements of information, making them suitable for representing conceptual knowledge. There are a range of online image repositories and tools that allow users to move beyond Microsoft's Paint and Clipart when they are creating and working with visual representations. Pixlr (http://www.pixlr.com/editor) provides online image creation capabilities that are strikingly similar to many of those in Illustrator but available free via a web-browser. Similarly, Photoshop Express (http://www.photoshop.com) provides browser-based access to a scaled down subset of image editing capabilities found in Adobe Photoshop. Sites such as Flickr (http://www.flickr.com) and Wikimedia commons (http://wikimedia.org) provide a range of images that can be used as starting points for image creations. These tools all support the individual creation of conceptual knowledge. However, there are also tools for collaborative image creation and editing. For instance, Dweeber (http://wdweeber.com), Scriblink (http://www.scriblink.com) and Scribblar (http://www.scribblar.com) provide free synchronous online whiteboards with text-chat and file-system facilities, with the latter two tools also including image-upload and voice capabilities. Online diagramming tools such as Autodesk (http://draw.labs.autodesk.com/ADDraw/draw.html) and Gliffy (http://www.gliffy.com) allow the online drawing and sharing of diagrams such as flowcharts and architectural designs. Thus contemporary Web 2.0 tools offer a range of options for either individual or collaborative construction of images, depending on the requirements for the learning experience.

Podcasting and the use of audio

The pace with which narrative can be contributed makes audio a natural modality for supporting dialogic approaches to learning. Free audio tools such as Garageband (MacOS) or Audacity (WindowsOS) it is possible for people to create, edit and enhance their audio recordings so that they can be made available as podcasts on their own web pages or podcast distribution sites such as Houndbite (http://www.houndbite.com) and Chirbit (http://www.chirbit.com). However, some sites are extending the ways in which audio is used online to support narrative approaches more naturally. For instance, Voxopop (http://www.voxopop.com) provides voice-based discussion boards that not only provide enhanced accessibility but also open up a range of new possibilities for audio-centric learning domains such as music and languages. Tools such as Blogamp (http://blogamp.com) allow audio-players to be embedded in blogs so that students can develop and reflect upon learning processes relating to speech and sound. At the same time, Voicethread (http://voicethread.com) allows the exchange of spoken contributions surrounding artefacts uploaded by users, creating the possibility for collaborative analysis using a dialogic modality that affords faster contribution and greater personalisation.

Video editing and sharing

Online video sharing sites such as YouTube (http://www.youtube.com), Vimeo (http://www.vimeo.com), Teachertube (http://teachertube.com) and Howcast (http://www.howcast.com) have made the exchange and use of video in the classroom a mainstream event. Because video provides a synchronised stream of audio and visual information, it is a particularly effective means of representing procedural information. Search engines such as Google video (http://video.google.com) or Vodpod (http://vodpod.com) allow these and other high quality videos from a range of reputed institutions (such as those from MITs open courseware, available at http://ocw.mit.edu) to be simultaneously queried using a single meta-search. Recently a range of online video editing tools have also become available, from tools that allow you to convert streamed videos to a variety of file formats for your computer (http://vixy.net), to play on your iPod (http://tooble.tv), and to create an online video with only the parts of a YouTube video you want (http://tubechop.com). While Movie Maker (Windows) and iMovie (Mac) provide free tools for creating and editing video, sites such as Jaycut (http://jaycut.com) provide video editing capabilities directly through a web-browser. Collaborative multimedia editing and video creation can be supported using Shwup (http://www.shwup.com). Ustream (http://www.ustream.tv) allows users to stream video instantly in order to create a live online television channel. The spectrum of tools available for sharing and editing video means that pedagogies can vary from being anywhere between transmissive to co-constructive.

Screen recording

Although screen-recording software is not strictly speaking a Web 2.0 technology, when shared online using sites such as YouTube they can create a powerful mechanism for supporting the learning of technological processes. Free screen-recording software such as Jing (Mac or Windows, outputs to SWF, available at http://www.jingproject.com), Camstudio (Windows, outputs to AVI or SWF, available at http://camstudio.org) and Wink (Windows, outputs to SWF, available at http://www.debugmode.com/wink) allow users to record and add audio commentary to their desktop actions. Jing also comes with a free online upload space for simple dissemination of recordings (http://www.screencast.com). This means that teachers and students can now capture and share IT processes in a form that better suits the content being represented, as compared to the more traditional approach of combining images with text.

Mindmapping

Drawing mindmaps encourages people to reflect upon the important elements and relationships of a concept or idea, which in turn can help improve the understanding. Freemind (http://freemind.sourceforge.net) and Xmind (http://www. xmind.net) are open source mindmapping tools that students and teachers can download and install on their machine, which allow the creation of dynamic maps incorporating a range of media and files. Recently a range of free browser-based mindmapping sites have emerged, which not only enables simpler access but also allows collaborative mindmapping to take place. Bubbl.us (http://bubbl.us) and Mindomo (http://www.mindomo.com) allow easy creation, saving and asynchronous sharing of mindmaps using a permissionable directory structure. Mindmeister (http://www.mindmeister.com) and Mind42 (http://www.mind42.com) allow synchronous editing of mindmaps, including image embedment features. Mind42 also providing an audio collaboration facility using the Google Talk gadget. Because mindmaps are suitable for representing schema, mindmapping tools can be used in a range of metacognitive tasks.

Digital storytelling

There are a range of Web 2.0 technologies that specifically support the telling of stories, from simply documenting a sequence of events to sharing stories that are deeply personal (Levine, 2010). These support users to move beyond Microsoft Photostory to use online image and audio mixing tools such as Animoto (http://animoto.com). Some interesting alternate genres are provided, for instance, tools such as Pixton (http://pixton.com/uk) and Toondoo (http://www.toondoo.com) allow users to create and share stories in the comic genre using text and a range of archived or user-uploaded images, all directly through a web browser. Kerpoof (http://www.kerpoof.com) and Goanimate (http://goanimate.com) and XtraNormal (http://www.xtranormal.com) to extend these features to enable the creation of animations. While the cartoon format may seem elementary, having students represent events or processes using such tools requires them to distil the relevant key information and summarise it in a new form, thus supporting commitment to memory and abstraction of processes.

Conceptualising Web 2.0 learning designs

A range of learning designs that utilise the Web 2.0 technologies discussed above is presented Table 2.

Anderson and Krathwohl's (2001) taxonomy has been used to organise the different types of knowledge and learning processes that can be addressed using Web 2.0.

Abbreviations have been used to indicate whether the nature of the learning design is more transmissive (T), dialogic (D), constructionist (C) or co-constructive (CC). While the brief and general descriptions provided in the table struggle to demonstrate the full potential of each learning design, they do provide catalysts for the development of engaging Web 2.0-based tasks.

Note that the cognitive process and knowledge refers to the subject matter content to be learnt, not to the way in which the technology is used. Also, the categorisations above relate to how the technology will be used by students, not by teachers. For instance, for a Remember-Process task where students are required to watch a video and recall the key stages of the process, it may be necessary for a teacher to first create the video, which requires a higher level of cognitive ability. However, the descriptions of the technologies that have been provided above allow educators to identify which technologies may be suitable for their task creation needs.

Table 2 comprises proposed tasks rather than an empirical collection, and many other alternatives could have been included. However, several noteworthy patterns exist. Firstly, Web 2.0 technologies enable a great range of opportunities for constructionist and co-constructive learning. Secondly, in terms of levels of knowledge, microblogging supports factual knowledge, wikis are suitable for conceptual knowledge, video and desktop recording support the sharing of procedural knowledge, and blogs and mindmaps are fitting tools to represent metacognitive knowledge. Transmissive pedagogies only appear in lower-order thinking processes whereas co-constructive pedagogies feature in higher-order thinking processes. This aligns with the proposition by Magliaro et al. (2005) that transmissive approaches are more suitable for early stages of schema development. This implies that Web 2.0 technologies that facilitate transmissive pedagogies may be more fitting for early stages of the learning cycle, whereas more constructive tools may be more appropriate in the latter stages of a learning cycle. While the trends that occur in Table 2 are based on proposed tasks and as such do not constitute evidence of effects, they do identify possible areas of further research and investigation.

A Web 2.0 learning design process

Determining the content and pedagogies for a particular learning design enables appropriate technology selections. The following elements need to be considered when performing the technology selection process:

(1) The overarching learning goals and objectives (outcomes).
(2) The type of content in terms of the knowledge that needs to be represented (factual, procedural, conceptual or metacognitive) and the cognitive processes with which students are expected to engage (from lower level remembering, understanding and applying to higher-order analysing, evaluating and creating).
(3) The type of pedagogy to be applied:
    (a) transmissive – early stages of learning to provide orientation and prerequisite information;
    (b) dialogic – providing students with the opportunity to more tightly define concept boundaries and negotiate meaning;
    (c) constructive – enabling students to demonstrate their understanding in an integrated and contextualised fashion;

Table 2. A framework of Web 2.0 learning designs.

Knowledge dimension	Cognitive Process dimension: Remember	Understand	Apply	Analyse	Evaluate	Create
Factual knowledge	*Microblogging* – document and share new items of factual knowledge with a group as they come to hand (D)	*Social bookmarking* – bookmark with facts relevant to a certain topic (D)	*Image creation* – construct an image that represents or describes an item of knowledge (C)	*Wikis* – analyse the definitions provided by peers and provide them with constructive comments on how to improve (D)	*Social bookmarking* – post comments evaluating the quality of factual information saved to the group social bookmarking site (D)	*Image creation* – use a collaborative whiteboarding tool to create new definitions for an area of innovation being considered (CC)
		Podcasting – provide definitions of terms on an audio discussion board (D)			*Blogs* – evaluate the factual quality of information on peer blogs and post constructive feedback (D)	
Conceptual knowledge	*Wikis* – identify the main concepts relevant to the topic on the wiki (C)	*Blogs* – explain the concepts and issues of a topic as they arise (C)	*Digital storytelling* – create a story that exemplifies/applies a concept (C)	*Wikis* – construct/adjust a knowledge network so that it appropriately interrelates concepts (C)	*Wiki* – evaluate the quality of peer conceptual explanations and make alterations/suggestions as appropriate (CC)	*Shared document creation* – collaboratively construct a report/campaign that addresses the key issues of a topic of study (CC)
	Image creation – draw an image to represent a concept or set of concepts (C)	*Presentation tools* – represent and present the knowledge and relationships of a conceptual domain (C)	*Video* – create a video that applies the concepts you have learnt to a concrete situation (C)	*Podcasts* – collaboratively analyse an image or artefact using Voicethread (D)	*Blog* – evaluate the conceptual quality of peers based on their blog postings and provide them with constructive feedback (CC)	*Mindmaps* – demonstrate a new conceptual understanding or innovation using a mindmap (C)
	Podcasting – listen to a podcast of a lecture and attempt to recall the main concepts (T)	*Wikis* – explain a set of concepts on a wiki (C)				

Table 2. (*Continued*).

Knowledge dimension	Cognitive Process dimension					
	Remember	Understand	Apply	Analyse	Evaluate	Create
		Mindmaps – draw a mindmap representation of a concept or domain (C)				
Procedural knowledge	*Video* – watch a video of a process and recall the key stages (T)	*Podcasting* – describe to your peers on Voxopop about the best way to perform a process and then provide constructive feedback to one another (D)	*Blogs* – create a portfolio explaining stages of a products development (C)	*Video* – analyse the way in which peers/self performs a process by posting comments on the video page (D)	*Blogs* – evaluate the production process that peers have described and post constructive feedback (D)	*Image creation* – draw a flowchart to explain a new process (C)
	Podcasting – create a podcast describing a process that has been observed (C)	*Digital storytelling* – observe an online storyboard and be able to explain the reasons for the processes' sequence of stages (T)	*Desktop recording* – create a desktop recording that demonstrates how to perform an IT process (C)		*Desktop recording* – evaluate the efficiency of peer/self IT process (C)	
			Video – create a video that demonstrates the application of a kinaesthetic process (C)		*Video* – evaluate performance of a kinaesthetic process and provide constructive feedback (D)	
Metacognitive knowledge	*Mindmaps* – describe own cognition using a mindmap (C)	*Mindmaps* – explain own thinking based on theories of thinking using a mindmap (C)	*Blogs* – explain how own approaches to learning changes as the subject progresses and as a result of reflecting on learning own processes (C)	*Blogs* – analyse own learning processes throughout a unit of study (C)	*Blogs* – evaluate the degree to which own learning processes improve as a result of self-reflection (C)	*Mindmaps* – suggest more efficient ways of thinking as a mindmap (C)

Notes: (C), constructive; (CC), co-constructive; (D), dialogic; (T), dialogic.

(d) co-constructive – utilising socio-constructivist approaches to enable students learn while creating together.

(4) The preferred modalities of representation (text, image, audio, and/or video) which will depend in part upon the type of knowledge being represented and the type of collaboration that will be associated with it, and the level of synchronicity required, which will depend on the educational context and the degree of reflective thought desired.

Based on these requirements and on an understanding of the potentials of different Web 2.0 tools to satisfy these requirements, a suitable technology can be selected and learning design applied appropriate to the discipline and its pedagogy. This necessitates knowledge of the types of Web 2.0 tools that exist and how their affordances relate to each of these requirements. A summary of a variety of Web 2.0 technologies (examples in brackets) is presented in Table 3.

Table 3 shows how these Web 2.0 tools can be used to satisfy different types of knowledge, pedagogical and modality requirements. The classification is not meant to be exhaustive nor prescriptive, but it aids the technology selection process by illustrating how the learning design elements may be used to infer Web 2.0 tools. It demonstrates that once the properties of Web 2.0 tools are understood they can be selected to support the type of knowledge, pedagogy, modalities and synchronicity that is required.

It should be emphasised that the categorisations represented in Table 3 are not intended to indicate the only learning designs that the different Web 2.0 tools can satisfy, as many tools can be used for many different purposes. For instance, video tools can be used to represent more than procedural knowledge; however, if procedural knowledge needs to be represented then video is an appropriate choice. Social bookmarking can be used in an individually constructive rather than co-constructive way; however, if a co-constructive approach is required then the characteristics of these tools make them suitable. Blogs can often embed video from external sites; however, if the task only requires text and image then blogs may immediately satisfy the requirements of the task. By providing a mapping of requirements to typical Web 2.0 tools, Table 3 demonstrates how properties of tools can inform the technology selection and design process.

Note that the types of pedagogies for different levels of knowledge and cognitive processes have not been defined to avoid being overly prescriptive – the particular pedagogies applied will take different forms depending on the discipline. The cognitive process does not feature in Table 3, as this is less associated with particular technologies and more related to the types of learning tasks that are designed.

Examples

These exemplars are derived from a second year education program at a higher education institution. As a part of their studies, students are introduced to the above Web 2.0 technologies. Tasks were designed by the teacher of the subject so that students demonstrated their learning using the technologies. Tables 4 and 5 represent a summary of the requirements of each learning design, and the screenshots provide an illustration of the sorts of Web 2.0 learning design solutions that were derived.

Table 3. A range of Web 2.0 tools categorised according to how they typically support different knowledge types, pedagogies, modalities, and synchronicities.

	Knowledge type	Pedagogy supported	Modalities	Synchronicity
Social bookmarking (Diigo)	Factual	Co-constructive	Text	Asynchronous
Image creation (Pixlr)	Conceptual	Constructive	Image	Asynchronous
Podcasting (Houndbite)	Factual; Procedural	Constructive	Audio	Asynchronous
Video sharing (HowCast)	Procedural	Constructive	Video	Asynchronous
Audio discussion boards (Voxopop)	Factual; Procedural	Dialogic	Audio	Asynchronous
Image discussion boards (Voicethread)	Conceptual	Dialogic	Audio; Image	Asynchronous
Desktop recording (Jing)	Procedural	Constructive	Video (comp. screen)	Asynchronous
Video editing (Jaycut)	Procedural	Constructive	Video	Asynchronous
Video collaboration (Shwup)	Procedural	Co-constructive	Video	Asynchronous
Animation tools (Goanimate)	Procedural	Constructive	Video	Asynchronous
Presentation (Prezi)	Factual; Conceptual	Constructive	Text; Image	Asynchronous
Wikis (PB wiki)	Factual; Conceptual	Co-constructive	Text; Image	Asynchronous
Blogs (Wordpress)	All	Constructive/ Dialogic	Text; Image	Asynchronous
Document creation (Google Docs)	Factual; Conceptual	Co-constructive	Text; Image	Asynchronous
Synchronous doc creation (Google Wave)	Factual; Conceptual	Co-constructive	Text; Image	Synchronous
Microblogging (Twitter)	Factual;	Dialogic;	Text	Synchronous
Multimedia microblogging (Coveritlive)	Factual; Procedural	Dialogic/; Co-constructive;	Text; Image; Video	Synchronous
Interactive whiteboards (Scribblar)	Conceptual	Co-constructive	Text; Image; (Audio collab)	Synchronous
Mindmapping (Mind42)	Conceptual; Metacognitive	Co-constructive	Text; Image; (Audio collab)	Synchronous
Web conferencing (DimDim)	Factual; Procedural; Conceptual	Co-constructive	Text; Image; Video; (Audio collab)	Synchronous

Example 1

One of the learning outcomes of the course required pre-service teachers to demonstrate their ability to provide clear instructions for their students about how to operate, manage and administer a blog (see Table 4).

Table 4. Elements of the blog management task.

Learning outcome	Pre-service teachers apply their technology skills to construct clear instructions about how to manage and administer a blog
Type of content (knowledge and cognitive processes)	This learning outcome primarily relates to demonstrating technology process knowledge. The outcome addresses the application cognitive process.
Type of pedagogy	In order to assess the ability of students to apply process knowledge it is appropriate to have students individually perform a constructive technology related procedure to evidence their understanding.
Modalities of representation	To capture the procedural nature of the task a video modality is suitable.
Synchronicity	As students are working independently, asynchronous capture is sufficient.

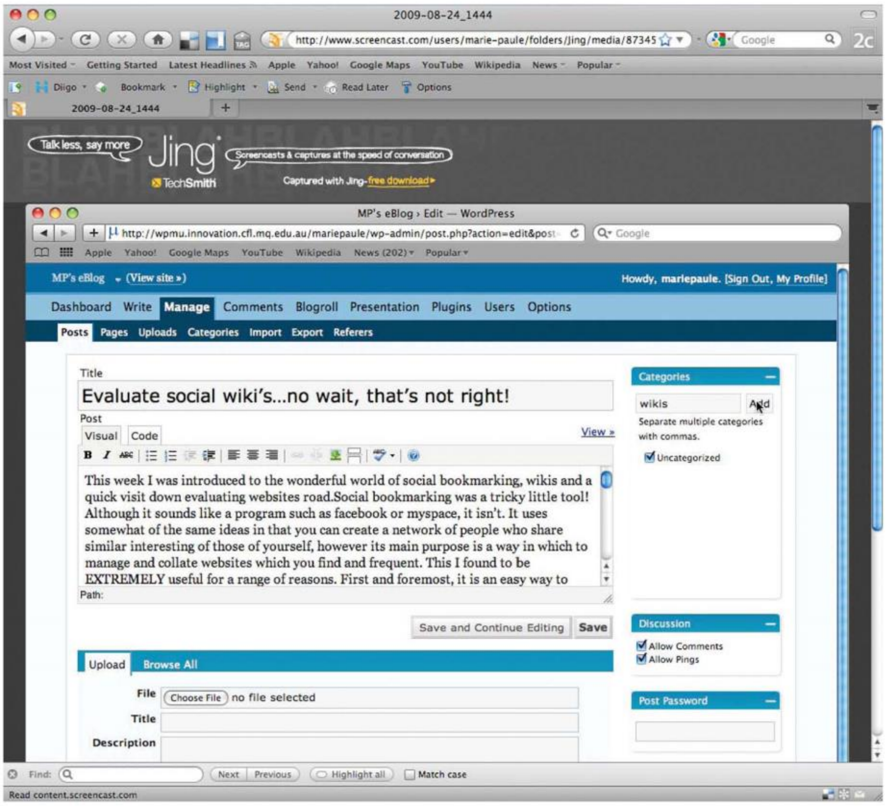

Figure 2. Student desktop recording demonstrating their ability to apply process knowledge. Jing logo and diagram created and used with permission by TechSmith Corporation.

Web 2.0 technology

Desktop recording – From Table 3 it can be seen that to support an *asynchronous constructive* computing-related task that applies *procedural* knowledge and is captured using video, desktop recording software (Jing) provides a suitable means of mediation.

Resulting Web 2.0 learning design

Students were asked to demonstrate and explain how to effectively organise and manage blog posts in their E-portfolio. The technology enabled students to construct asynchronously a recording that demonstrate their procedural knowledge. The video modality enabled them to represent their process more naturally and clearly than using text and/or images. Learning this technique provided them with the capabilities to provide IT instructions to their prospective students.

Example 2

Another learning outcome required pre-service teachers to demonstrate an understanding of the sorts of contemporary technologies available, analyse their potentials and discuss issues associated with their use (see Table 5).

Web 2.0 technology

Wiki – From Table 3 it can be seen that to support an *asynchronous co-constructive* task that requires students to identify, analyse and evaluate *factual* and *conceptual* knowledge, a wiki provides a suitable means of mediation.

Resulting learning design

At some stage in the first three weeks, the pre-service teachers were required to select a contemporary learning technology (either software application or website) and provide a summary of it on the wiki. At the beginning of week four, ensure the page is appropriately situated and linked to other pages on the wiki.

Table 5. Elements of the technology analysis task.

Learning outcome	Students can identify and interrelate a range of contemporary technologies and evaluate issues associated with their use in the classroom
Type of content (knowledge and cognitive processes)	This outcome relates to demonstrating factual and conceptual knowledge. The learning outcome addresses the identification, analysis and evaluation cognitive processes. Thus the task should require students to describe, classify, deconstruct, interrelate and critically evaluate technologies.
Type of pedagogy	In order to benefit from the analysis and reflections of others and because of the large scope of the task, a co-constructive pedagogy is useful.
Modalities of representation	The factual and conceptual nature of the knowledge means that text and images provide suitable modalities of representation.
Synchronicity	As students may complete this task from different places and at different times, asynchronous interaction is appropriate.

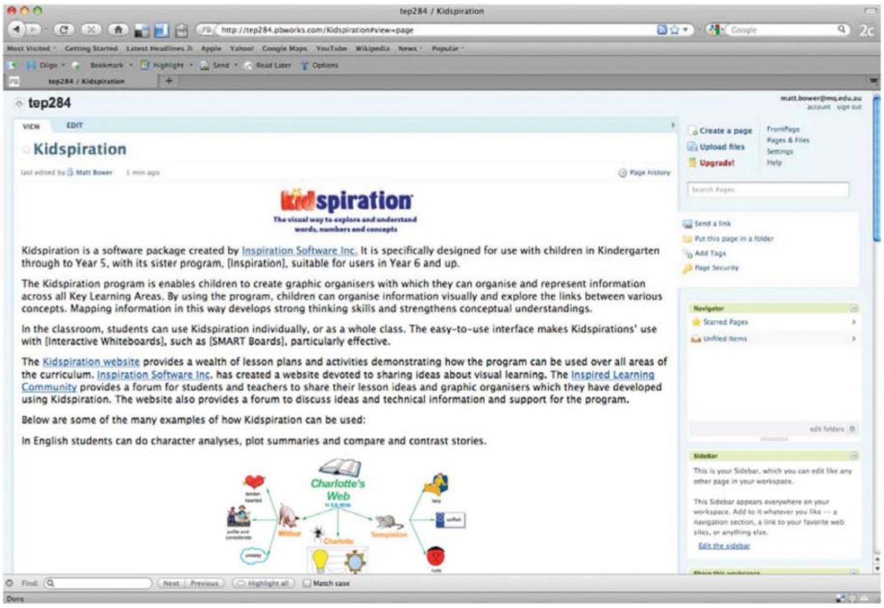

Figure 3. Student wiki page demonstrating their ability to describe, link and evaluate factual and conceptual knowledge. Kidspiration® logo and diagram created and used with permission by Inspiration® Software.

The wiki with its native ability to represent images and text affords asynchronous representation of students' factual and conceptual knowledge. The co-constructive nature of the task allows students to extend their knowledge base by learning from one another. Requiring students to situate and link their page to others within the wiki encourages them to classify and interrelate their knowledge.

Reflections

With the rapid advancement of technology, it is challenging for educators to ensure that learning design approaches remain current. However, while the tools are changing at an ever-increasing rate, the content and pedagogies are in most cases relatively constant. In order not to be overwhelmed by the continually changing educational technology landscape, it is important to retain a focus on technology as a mediator of interaction and a means of representing content. In this way, educators can concentrate on pedagogy and disciplinarity, which are the central features of the learning design, without being overly distracted by the technology.

This paper has suggested conceptualisations and processes to support Web 2.0 learning design. Learning designs can be conceptualised in terms of their content (type of knowledge and cognitive process) and the type of pedagogy they apply (either transmissive, dialogic, constructionist or co-constructive). In this paper, Anderson & Krathwohl's (2001) Taxonomy of Learning, Teaching and Assessing is used to frame different learning design possibilities based on Web 2.0 tools and the types of pedagogies being applied.

Learning design processes require educators to consider the types content and pedagogy being applied, as well as the types of modalities and the degree of synchronicity that is appropriate for the pre-identified learning objectives. Technology selection decisions can then be made based upon the capacity of tools to support these needs. In effect, this enables learning designs to be driven by the cognitive and collaborative requirements of learning episodes rather than the ever-changing nature of technology. Table 3 illustrates how particular Web 2.0 technologies may be implied from the pedagogical, content, modality and synchronicity requirements of tasks, and it is these properties that will determine the utility of new Web 2.0 tools as they emerge. It is hoped that the constructs presented in this paper supports educators to more immediately and effectively leverage the potential of Web 2.0 technologies as they reach out to their students in a range of contexts.

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11 Appendix C: Realising the potential of Web 2.0 for collaborative learning using affordances

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Realising the Potential of Web 2.0 for Collaborative Learning Using Affordances

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Abstract: With the emergence of the Web 2.0 phenomena, technology-assisted social networking has become the norm. The potential of social software for collaborative learning purposes is clear, but as yet there is little evidence of realisation of the benefits. In this paper we consider Information and Communication Technology student attitudes to collaboration and via two case studies the extent to which they exploit the use of wikis for group collaboration. Even when directed to use a particular wiki designed for the type of project they are involved with, we found that groups utilized the wiki in different ways according to the affordances ascribed to the wiki. We propose that the integration of activity theory with an affordances perspective may lead to improved technology, specifically Web 2.0, assisted collaboration.

Keywords: Collaborative Learning, Web 2.0, Affordances, Activity Theory
Categories: H.4.3, J.1

1 Introduction

Complex social networks are not new, however due to recent technological developments social networking has emerged as a dominant form of social organization [Wellman, 02]. Technology has allowed individuals to form communities based on their shared interest rather than kinship or locality. This significant proliferation of the Internet has shifted our paradigm of community and interaction and opened up new possibilities in the workplace and learning environment. Either within the corporate boundaries or in academic settings, in the virtual and networked organizations, people are working with shifting sets of supervisors, peers, and subordinates [Wellman, 02]. Web 2.0 provides the social software to both inspire and support these new ways of interacting. In the educational realm, Web 2.0 is particularly attractive with respect to collaborative learning.

Many claims have been made about Web 2.0 tools, but many were made without strong evidence [Mason, 08]. As we found in the two case studies reported in this paper, making Web 2.0 technologies available to students does not guarantee their utilization or improvement in learning outcomes. There is still a need for deeper conceptualisation of the relationship between Web 2.0 tools and teaching-learning processes [Carsten, 08] to clarify how and through what mechanism Web 2.0 tools support learning. Similarly, in the early days of groupware, studies found that while groupware held potential for distance education and collaborative learning it was "not completely successful for all learners in all situations" [Schrum, 96]. Failure was attributed to a lack of understanding of factors such as appropriate applications, group processes and problem solving.

Initial attempts to employ Web 2.0 technologies for collaborative learning, such as the work by Mason & Rennie [Mason, 08], tend to be centred on the technology itself and provide informal ways of looking at each individual tool closely as a separate phenomenon. A fully conceptualised framework is needed to refocus the investigation towards components of a learning activity and addresses issues such as choice of modalities, group interaction and social negotiation of meaning. This paper seeks to lay the foundation argument for that framework based on Norman's notion of affordances [Norman, 88]. The framework acknowledges that Web 2.0 tools are embodied within the new social interaction phenomenon and can pervade every aspect of a learning activity.

In this paper we present two cases studies which investigate the usage of a particular wiki to support group projects. Firstly, we briefly introduce Web 2.0, followed by an explanation of Engeström's Activity Theory which we employed to redesign the unit considered in the first case study. The case study revealed haphazard and varying usage of the wiki which had been provided to support collaboration. Again using an evidence-based approach, we conducted a second case study involving groups of second year students conducting their first group-based activity. Employing an affordances perspective we characterise the utilisation patterns in both case studies. We conclude with future work suggesting the incorporation of activity theory with the affordances perspective.

2 Web 2.0

Awkwardly named, the term "Web 2.0" was first coined in a brainstorming session with no clear definition attached to it. The term was given the misleading numerical "2.0" designation, which would normally indicate a new major software release that was replacing a previous version. Summarising O'Reilly's [O'Reilly, 05] observations of the new web-based applications, Table 1 is adapted to show the distinctions between this new breed of system comparing characteristics with their earlier counterparts; further annotation on the outer columns are added to clarify the explanations. The key characteristics of viewing the web as a platform and harnessing collective intelligence have driven the paradigm shift. It is not merely a medium of communication between applications, the web itself has become the application. Participants are no longer just consumers of content; they are producers as well, leading to the trend of user-generated-content. The value of a service can now be measured by the number of people using and contributing to it, rather than the traditional measurement which considered the number of viewers.

The Web 2.0 phenomenon continues to proliferate due to the growing internet-connectedness and improving quality of connection and has redefined the playing field. At its core, it is still just a collection of tools, but these tools have enabled the extension of social interactions and relationships well beyond the physical boundaries (e.g. facebook, friendster), connecting people with the same interests (e.g. linked-in), creating virtual communities (e.g. myspace, ning) that share each other's thoughts, learn from each other and contribute artefacts such as text (e.g. wikipedia), pictures (e.g. flickr, picasa), audio (e.g. voicethread), video (e.g. youtube, howcast), browsing history (e.g. del.icio.us, stumbleupon), and annotated web pages (e.g. diigo) or even location-specific information that can be pulled out by GPS-enabled handheld devices and presented by augmenting the information layer on top of the "reality" as seen through a camera; all of these are done on a scale and in ways which has not been possible before.

Basic service	**Web 1.0**	**Web 2.0**	**New characteristics**
Online advertisement	DoubleClick	Google AdSense	Dynamic advertisement based on the page content
Photo sharing	Ofoto	Flickr & MySpace	Personalized templates, tagging, annotating & comment
Website	personal websites	blogging	
File sharing	Akamai	BitTorrent	Peer to peer source & each downloading machine becomes server
Music sharing	Mp3.com	Napster	
Online encyclopaedia	Britannica Online	Wikipedia	Open content & collaboratively written
Online event organizing	Evite	upcoming.org & EVDB	Event request & comments from collective users
Identity	domain name speculation	search engine optimisation	Marketability
Visitors volume	Page views	cost per click	Navigation behaviour
interfacing 2 programs	screen scraping	web services	Merging into 1 platform: The Web.
Centralized authorship	Publishing	participation	Democratisation of authorship
Centralized managed content	content management systems	wikis	Open content
Pre-defined	directories (taxonomy)	tagging ("folksonomy")	User-defined
Single provider	Stickiness	syndication	Federated provider

Table 1: An Observation-based Comparison of Web 1.0 Vs. Web 2.0 (expanded from [O'Reilly, 05])

2.1 Impact on learning

From an educational viewpoint, the proliferation of computer-supported social networks has promoted the constructivist approach to a greater community than ever before, requiring teachers to start taking the transition seriously. An often made call for educators to change the way they teach has recently become more apparent. Jonassen, Peck & Wilson [Jonassen, 99] explained there are two implications when teachers make the transition from the traditional transmission model to the self-regulated learning model:

- Firstly, teachers have to relinquish some of their *intellectual authority*; as learners need some space to construct their own meaning of the world. Teachers thus can't be too instructive in the learning design. The teacher's role has shifted from knowledge transmitter to facilitator who assists students to both discover the larger community of scholars in a particular topic and evaluate their own beliefs and understanding compared with the generally accepted conceptions. Perkins [Perkins, 92] called this journey a "conflict-faced" path.
- Secondly, teachers must further relinquish the *managerial authority* of the learning process itself; teachers are, *de facto*, no longer in full control of all the learning activities which learners can embark on; there are a significant number of resources available and relatively accessible and this makes it almost impossible to determine what a learner can and cannot know. This also means that learners are required to become gradually more "self-regulated", and be more responsible in managing their own learning tasks [Collins, 89], [Perkins, 92].

We are particularly interested in handling the effects of loss of managerial authority. Activity theory provides a rich understanding of the learning process and thus offers a framework for understanding how learners utilise Web 2.0 tools to inform learning design decisions.

2.2 Activity Theory

Social interactivity is clearly at the core of Web 2.0, therefore any design framework that intends to inform use of Web 2.0 tools needs to place social interactions and relationships at its core. Activity theory [Engeström, 87], [Jonassen, 02] focuses on the broader social and cultural context of human activity, allowing a comprehensive explanation of social interactions and relationships. Central to activity theory is the idea that the appropriate unit for analysis of human activity is an activity system which involves a group of people working towards a common motive [Engeström, 87]. Activity systems explain how people interact, with each person contributing to the fulfilment of a common motive.

Engeström [Engeström, 87] developed a framework to describe activity systems (Figure 1). The framework describes how the efforts of a group or an individual towards an object are mediated by instruments of production, rules and customs, the community and the division of labour. The relationships between these components are represented with four subsystems: production, exchange, consumption and distribution. Activity systems contain a hierarchy of social activity, individual actions and individual operations [Engeström, 00]. These relate to a collective motive, individual goals and individual conditions, respectively. [Brentsen, 02] describe this hierarchy as explaining why, what and how the activity takes place (Figure 2).

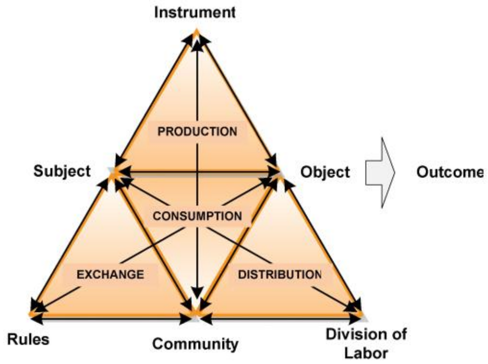

Figure 1: Development of Human Activity Theory [Engeström, 87]

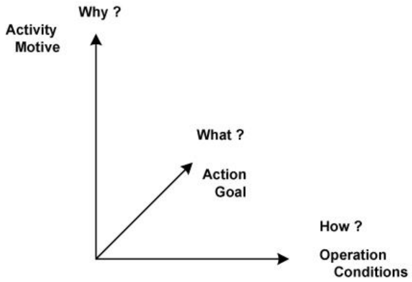

Figure 2: Constituents of activity as analytical dimensions [Brentsen, 02]

In today's complex and highly integrated software systems, design cannot be achieved by an individual and thus "doing" design involves collaboration. From a learning perspective, collaboration involves working with peers and teachers. Working in teams is an essential graduate capability for Information and Communications Technology (ICT) students. We were interested to understand how ICT students collaborated and in particular what role Web 2.0 technologies might play in supporting them to design a software product. Two case studies involving two separate cohorts of ICT students are considered next.

3 Studies into Collaborative Learning and Web 2.0

As some motivating background to the two studies we conducted and prior to the emergence of Web 2.0, in 2004 we conducted a 30 item online survey with our second and third year ICT undergraduates to better understand their learning experiences and needs. From the 103 responses received, we found that students had various perceptions of the role of collaborative learning. While group work did not feature as a typical response to how lectures, tutorials or practicals (laboratory sessions) could be improved, it was the second most common response to the open-ended question "describe the ideal way for you to learn computing". To determine how much collaborative learning was currently going on we asked what percentage of time was spent learning computing alone. The response was an average of 72.3 % of their time; meaning 28% is spent working with others. However a subsequent question which asked how much time they would like to spend working with others, the response was an average of 44%, with the mode response of 50%. This was a highly significant difference between the observed and desired amount of time spent working with others (paired t-test, $t = 7.78$, $df = 99$, $p < 0.001$). The 16% absolute difference becomes a more substantial figure when it is considered as a proportion; on average students wish to spend an extra 60% more time working with others. Interestingly 37 respondents thought working alone was more effective for them to learn computing. 64 did not agree that working alone was better for learning computing. Students were asked about the benefits and drawbacks of working in isolation and of working in groups. The results are shown in Tables 2 and 3. Furthermore, 72 respondents believed that lecturers should provide more formal opportunities for working with others in the activities they set, but 28 disagreed.

Less distractions	28
Can focus on concept formation/difficult problems	14
Can choose own pace	13
More time efficient	12
Can choose own area to focus upon	9
Not held up by less motivated/lower ability peers	9
Flexibility of time chosen to work	7
Satisfaction of personal achievement	7
Fairer (since credited for work performed)	5
Less conflict	5

Table 2: Responses to "What things do you like about learning computing in isolation? What are the disadvantages of working with others?" (comment/frequency)

Can get help/alleviate frustration of being stuck	27
Can improve techniques/understanding	16
Saves time	13
Seeing things from multiple perspectives	12
Finding solutions/errors they wouldn't have otherwise	12
More fun/less boring	7

Table 3: Responses to "What things don't you like about learning computing in isolation? What are the advantages of working with others?" (comment/frequency)

For tasks that specifically involved collaboration, 39 preferred to meet with their group online from anywhere and 63 preferred to meet with their group face-to-face rather than online. The preference for face-to-face communication by our students was confirmed in a separate virtual laboratory study we conducted [Bower, 05] where only 25% of the online groups chose to participate from home.

Since the advent of Web 2.0 in 2005, characterised by the increasing pervasiveness of social software (e.g blogs, wikis, chat rooms, communities of practice, etc) and other technologies (e.g. MSN, text messaging, etc), we were interested to see if student attitudes to online communication had changed. Specifically we wanted to see if they were ready to embrace the use of technology to collaboratively learn and collaboratively design. This time rather than use a survey instrument as in 2004 which clearly revealed a mismatch between reported desire and action when it came to collaboration, we used a more evidence-based methodology by examining the actual collaboration recorded online and also the methods reported by groups in their project plans, personal blogs and other documentation. We conducted two case studies in 2008 involving two separate cohorts of students. To focus our data collection and analysis we limit our attention to the students' utilisation of wikis for collaboration in group activities.

3.1 Case Study 1 – Introducing affordances

The first case study involved two 3rd-year computing project units at Macquarie University. A total of 54 students in 11 groups, comprised of 4 or 5 members, participated in the study in Semester One 2008. The units are compulsory for students enrolled in the Bachelor of Information Technology or Bachelor of Information Systems at Macquarie University. These are capstone units [Clear, 01] aim to tie together the student's previous learning and prepare them to enter the workforce. Students are observed to have high interest and a level of engagement with the unit.

The units were built around a single project, which the students have to work on as a team for the whole semester. The project was their key activity and it is both the learning vehicle as well as the assessed outcome for the units. The teams were asked to take on the role of a software development team to design and build a computer-based solution for a hypothetical client. The team activity involved gathering user requirements, developing models and designing and implementing a solution from among the range of possible solutions they have identified. At the end of the activity, the group was expected to deliver the final software product and all project documentation, which were marked. The groups were formed by the lecturer at the beginning of the semester based on the student's grade point average (GPA), gender, time availability, personality type, planned time commitment and their grade expectations.

The units were first offered in 2005. In 2008 the units were redesigned due to the observation that an increasing number of groups were experiencing internal conflict with team members. For the redesign, as recommended by Jonassen & Rohrer-Murphy, [JonassenRohrer, 99, pp. 63-66] we applied activity theory by reconsidering the:

- *Tools* – resources used in the transformation process, either physical such as computers, or mental such as heuristics;
- *Subject* – the individual or group of participants engaged in the activity;
- *Object* – the physical or mental product being developed;
- *Community* – the interdependent aggregate who share a set of social meanings ;
- *Rules* – social regulations that inherently guide (to some extent) the actions or activities acceptable by the community, so that the signs, symbols, tools, models and methods that the community use will mediate the process;
- *Division of Labour* – prescription of task specialization for members within the community.

As a result we redesigned the learning outcomes and the aligned assessment tasks. Two of the five intended learning outcomes (ILO) concerned collaborative learning. To encourage successful teamwork a three hour training session on team skills was provided in week 3. A number of assessed discussion boards and a reflective online personal blog were also established on Blackboard to encourage communication, knowledge sharing and participation. To assist students in managing their group's project resources, an open source tool known as Trac (http://www.edgewall.com/Trac/) was introduced. Trac is an "enhanced wiki and issue Tracking system for software development projects" which started at the University of Sydney and has been developed as open source software.

Based on the findings of Kay et al. [Kay, 06], the system was expected to sustain the big five elements of teamwork [Salas, 05]: team leadership; mutual performance monitoring; backup behaviour; adaptability; and team orientation. At the core of these collaborative elements is the Trac wiki's functionality, which binds together the other project management processes support functions in Trac.

Each group was given its own space within Trac and encouraged to utilize the tool as it deemed appropriate, while also being allowed to adopt other tools to support their team's activity. Formal training on the use of Trac was not provided, as the first part of this study did not wish to influence the students' perceived affordances of the tool, but students had access to and were informed about the availability of standard documentation that came with the system. The wiki in Trac was seen by the teacher to provide a communication channel for the internal use of the group. The discussion boards provided a similar function to the wiki but at the class level. The personal blog supported private communication between individual students and the teacher.

3.1.1 Data Collection

The case study gathered data from the groups' reflective journals and via a written report worth 10% which required the team to look at the processes they had gone through for the entire semester, considering issues and challenges they faced, what they had done and learnt, what worked and what didn't. Data was also gathered from the Trac system logs and the groups' wiki pages to describe how each group used their wiki functionality to support collaboration.

3.1.2 Case Study 1 Findings

Five categories of utilisation were observed in the Trac wiki. These are discussed below, ordered by their sophistication in supporting collaboration. Table 4 provides a matrix detailing how each group had used their Trac wiki.

1. The first category is the complete absence of usage (N=1). Group 4 did not utilize the wiki feature at all. This occurred because of a technical mismatch with the system they were building. They were given permission to use their own version control system. It is unclear whether any product in place of the Trac wiki was employed. However, the group reported some difficulties in managing collaboration, such as miscommunication of responsibilities and difficulties in sharing resources.
2. The most basic and the second most popular (N=7) use of the wiki was as a communication medium to facilitate the exchange function of the learning activity system. The dominant pattern of this use was a single group member posting an announcement for the others to view. The exception was group 11, which used the wiki as a medium for bidirectional communication amongst team members.
3. The most popular (N=8) use of the wiki in this case study was as a shared files vault, where each team member or an appointed person uploaded files for later reference, a need that is driven primarily by the nature of the unit which produces numerous deliverables. The feature of uploading, storing and downloading files became the most popular use of the wiki.
4. A more sophisticated use (N=3) of the wiki was as a coordination web space. In this usage, wiki postings were predominantly done by a single group member, with the postings positioning the wiki as a workgroup portal to access other parts of the Trac system and share resources.
5. The most sophisticated use (N=1) of the wiki was to create a collaboration web space, where the wiki has been personalised and multiple members contributed to the wiki.

The reflective journals also revealed that students had been using other external tools to support their collaboration and communication. It interesting that some of the functionality utilized in these other tools was available in Trac. Their decision to utilize a feature in a particular tool rather than in another raised the question of why such a phenomenon may have existed.

Utilization of Trac Wiki	**Group no.**										
	1	**2**	**3**	**4**	**5**	**6**	**11**	**12**	**13**	**14**	**15**
Communication (exchange) • Post announcement		✓	✓		✓	✓	✓		✓	✓	
File sharing • File upload and download	✓		✓		✓	✓	✓	✓		✓	✓
Coordination web space • Coordinate workload (distribution) • Tracking progresses • Share bookmarks (consumption)			✓		✓					✓	
Collaboration web space • Multiple contributors • Personalized sections (collaboration)			✓								

Table 4: Utilization of Trac Wiki in Case Study 1

3.1.3 Case Study 1 Discussion

The results show that although the groups had access to the same software and had the same motive to produce deliverables, each group differed greatly in how they went about the group activity. The most notable result was that only one group used the wiki in a way that can be described as Web 2.0, creating a collaborative web space which supported both personalisation and co-construction of meaning. The other groups that used the wiki utilised the features in a way that supported communication but didn't reach the level of social interaction that characterises Web 2.0. One group didn't use the wiki at all.

Activity theory provided an appropriate framework for the design of collaborative activities; however the collaboration occurred in very different forms. In order to properly use Web 2.0 to support collaborative learning, greater emphasis is needed on understanding how group members relate to each of the available features of the software. The concept of affordances appears to provide the ability to focus on the way specific features of software are perceived.

Affordances describe the possibilities of action between a person and an aspect of the environment [Gibson, 79] and can be used to describe features of software which may support learning [Bower, 08]. Groups using the Trac wiki had access to a range of affordances that may be used to support collaboration. However, the groups differed in the way they realised these affordances.

- The group in category 1 did not utilise any affordances.
- Groups in category 2 utilised the communication affordance of the wiki, posting notes for other members.
- Groups in category 3 utilised the file sharing affordance of the wiki (i.e. uploading and downloading files).
- Groups in category 4 combined the affordances displayed by category 2 and 3 and utilised the wiki to provide coordination affordance in dividing the work amongst team members and coordinating tasks.
- A single group (category 5) took it one step further by not only utilising the affordances mentioned above, but also utilising the wiki to aggregate resources and personalize access.

Viewing usage of the wiki as the utilisation of affordances provides a framework for exploring the gap between the potential collaboration afforded by the wiki and the way the wiki was used. In the second case study which follows we have sought to identify what affordances might be attributed to the Trac wiki.

3.2 Case Study 2 – Characterising Affordances

To gather more data and see if we could refine and define the affordances associated with Trac, a second case study was conducted in the second half of 2008 using 144 second year undergraduates enrolled in a unit called "Requirements, Analysis and Systems Design" (RASD). These students needed to collaborate for a group-based assignment involving the review and revision of a requirements document, creation of the analysis models and design models including the system architecture, design of screens, report and complex algorithms. Students were given 8 weeks (including the two-week mid-semester break) to produce the specified designs. Groups of 5 were formed in week 4. This was the first unit these students had experienced involving working with more than one other student on an assessment task. Just over half of the teams chose to self-form (groups 1-18). The lecturer formed the remaining 11 groups.

To ensure all students met the learning goals, students were required to participate in all types of tasks. For example, rather than one individual do all the UML sequence diagrams, each student needed to contribute at least one of the sequence diagrams to the final solution. Class and Use Case diagrams were to be the result of collaborative discussion. The first task (out of 16) in the assignment required a half-page team statement which outlined team members and their roles, planned methods of communication, conflict and change management strategies. The second task required students to use subversion for version and change control and also to use Trac. Failure to use subversion resulted in the loss of marks. Use of Trac attracted bonus marks. Data was collected in the same way as for case study one (see section 3.1.1). The next subsection considers the patterns of usage of Trac by the 29 groups followed by consideration of other collaborative technologies used.

3.2.1 Case Study 2 Findings with Trac

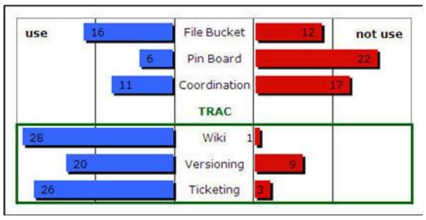

Figure 3: Trac wiki utilization in Case Study 2

There are a few common usage patterns observable for Trac by the RASD cohort. Many of these are similar to those found in the first case study. As shown in Figure 3, 28 of the 29 groups chose to use Trac, 20 used versioning and 26 used ticketing. In contrast, the unit convenor noted that in the previous year's offering of this unit only around half of the groups decided to use Trac, despite usage being worth bonus marks, and those that did use Trac made very little use of the features of Trac beyond uploading files. In 2008, 20 groups out of the 28 (71%) utilized Trac for more than document versioning (which was mandatory in the assignment specification). These groups utilized the wiki components as well as the ticketing system as communication tools. However, most of the usage was one-way communication (involving posting announcements, minutes of meetings, news and other resources) that most commonly was done by one and the same group member (90%). Only two groups out of 20 used the system as a multi-way communication tool by giving comments to other posts and using the wiki as a discussion board (e.g. see Figure 4).

Despite being given the same instruction and opportunity, it appears that teams perceived the Trac system to have different affordances and utilized those affordances according to their needs. We then tried to characterize a number of specific affordances in relation to the activity students are engaged in. There were three dominant groups: Subject-Rules-Community (Exchange); Subject-Tools-Community (Production-Consumption); Subject-Division of Labor-Community (Consumption-Distribution). Note that a group may exhibit behaviour, which indicates more than one affordance for Trac.

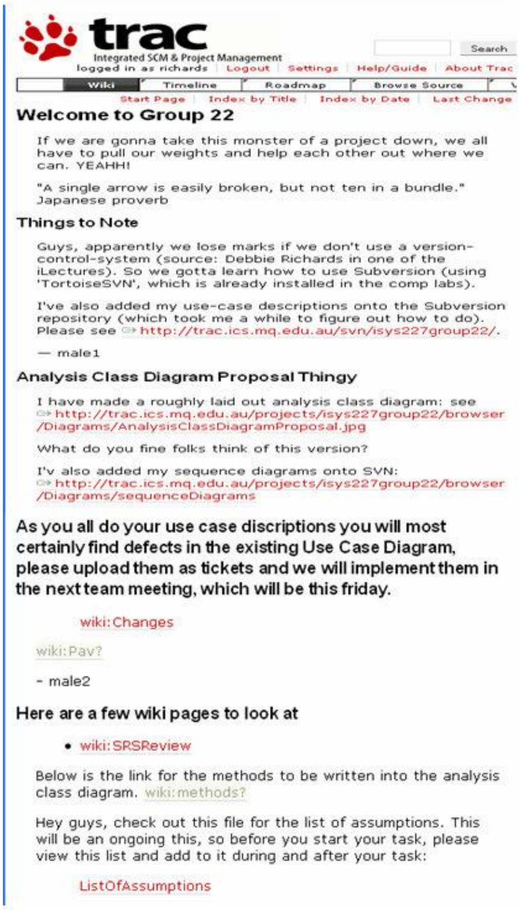

Figure 4: Sample Wiki from Group 22 showing a multi-way communication tool.

3.2.1.1 Subject- Rules-Community (Exchange) affordances

The exchange affordance enables the members of a group to pass comments to one another that do not necessarily contribute directly to the production of a shared object (i.e. the design documents), but contribute to support of the community itself. For example, comments may be added which inform other members what they are doing socially to indicate their (un)availability or even just to share some of their lives with the others beyond the contact needed to achieve the project tasks.

3.2.1.2 Subject-Tools-Community (Production-Consumption) affordances

The combined production-consumption affordance enables each individual to produce a publishable work online and share it with other members of the community (e.g. through online publication or attachment of files), who in turn would then individually consume that object and produce another (e.g. their own part of the work). There are basically two types of such affordances, which we call File Bucket and Pin board.

File bucket. As shown in Figure 3, the file bucket use was the most commonly used (16/28 - 57%) of the production-consumption affordances, where the community utilized the tools as a place to upload and store files then share them amongst the members of the community. Some groups structured and customized the wiki pages in the system to allow the files and resources to be categorized and structured; while others placed all files on a single page containing a list of the shared resources whiteboard.

The Pin board. There was a 21% adoption of the pin board affordance, which was mainly used to publish drafts or previews of the assessment deliverables and share those publications with other members of the group, such as shown in Figure 4. Each group then built their own discussions or other form of information exchange around this published document. It is observed that, groups who adopted this affordance became more active in the adoption of the exchange affordances.

3.2.1.3 Subject-Division of Labor-Community (Consumption-Distribution) affordances

The combined consumption-distribution affordance enables the group to break down the workload into smaller (i.e. individualized) and more manageable workload chunks for which each group member would then be responsible. The process of breaking down the workload was tied closely to the way each part of the work is consumed within the group. Surprisingly only 39% of the groups utilized this affordance, ranging from a simple list of tasks that were managed manually, to adoption of the built-in task ticketing system to dispatch and track work assignments. Although many tickets may have been raised, it appears that students still heavily relied on other collaboration strategies (e.g. face to face and email) to perform coordination functions.

3.2.2 Case Study 2 Findings with Other Systems

The study also revealed that students tended to use a set of tools rather than just one tool to support their collaboration. There is a particular affordance that students look for in each tool and they seem to prefer using a mix of tools rather than just one. Figure 5 shows that while the traditional email system still prevails as the preferred primary collaboration tool (82%), other systems such as mobile (cell) phones, web based wiki and online chats have become more widely used with 58%, 53% and 41% usage, respectively. Only two groups (12%) utilized other discussion forums.

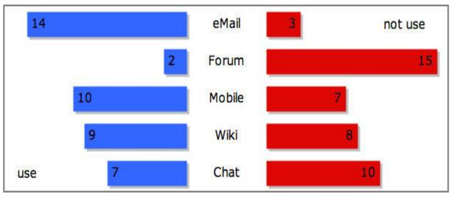

Figure 5: Preference of use for a range of communication tools

3.2.3 Web 2.0 Tools as a Distraction or a Collaborative Aid

In the 2004 survey introduced at the start of this section, distraction was given as the most frequent response by a factor of at least 2 to the question asking "why is working in isolation better?" Wikipedia defines distraction as "diversion of attention of an individual or group from the chosen object of attention onto the source of distraction". We interpret distraction in the context of group work to encompass increased interruptions, communication overheads involving more travel time, more time-constrained and effort-intensive decision making due to conflict resolution, and increased number of unproductive activities not directly related to the task.

We were interested to see if our Web 2.0 enabled students (who are increasingly choosing to distract themselves by being constantly connected socially via technologies such as text messaging and who are spending many hours online) still consider group work to be too distracting. By observing their usage patterns in Trac and their approach to handling group communication (described in their team statements) we found students in 2008 were more inclined and enabled to collaborate than the students in 2004. To determine whether the high level of collaboration we observed in the second half of 2008 reflected that groupwork was no longer seen as a distraction we conducted a lightweight email-based and optional survey asking the three questions shown in Figure 6. Nineteen responses were received and recorded in brackets after each option in Figure 6. Selected comments to each question are shown in Figure 7.

```
Pick the option that matches your view:
1.Working in groups is a distraction from getting the work done.
   Strongly agree (4)
   Agree (1)
   neither agree nor disagree (3)
   disagree (7)
   strongly disagree (4)
2. "Using technology like MSN, Trac, email, etc, helps to mini-
mise the distractions involved in group work"
   Strongly agree (8)
   Agree (8)
   neither agree nor disagree (2)
   disagree (1)
   strongly disagree (0)
3. What technology did you use that assisted you to learn col-
laboratively?
```

Figure 6: Lightweight survey with RASD students

Q1 Maybe for a 100 level subject, but as far as with the 200 level group work, i think everybody that is still enrolled in the course is there to do well or at least pass, so group work is not a 'social' occasion as it once was. (male)
I don't think it has very much impact because groups can work just as efficiently with it, if not sometimes better? In cases where they live far apart and travelling is an issue. (male)
Q2 The use of Trac and email did in fact keep me from being lazy and leaving my work till the last minute,, i can put that down to the use of a bonus mark for the use of Trac. (male)
Q3 Trac was helpful in keeping Trac of everything :) and email was a big help. MSN would have been good if the other members were actually on when needed to be. (female)
The technology of Trac which enabled us to work in more professional manner. We divided our task and updated it on Track which helped us to finish the work on time and also the work could also be timed. (male)
Text messages helped with organisation, Trac helped us complete the actual project (male)
Trac and the svn repository, but none of them work out without organisation/planning (female)
Not really MSN between all member, too hard to organise, but for like 2-4 teammates, it's good. (male)
Other unsolicited comments received include:
Its good having group projects, it is harder to organise but it promotes communication (male)
All in all, a pretty rewarding assignment, I think the group work was needed, not so much as to cover the content, but to allow an insight into what it would be like actually designing or collaborating ideas for a real life system. that is dealing with other ideas and working as a team and learning to be very diplomatic very quickly...(male)

Figure 7: Comments from RASD students

In answer to question 3, email was the most common and most used form of communication, then Trac, then SMS, then phone, then MSN. The learning management system discussion board was also mentioned by one student. The one person (male) who responded differently to the others had these comments:

- *Q1 - Strongly agree - Motivating other group members should not be another students concern or responsibility.*

- *Q2 - Strongly disagree - If the whole group utilised the tool it would have been invaluable but in my experience (assignment 2), it was ignored by most group members.*
- *Q3 - E-mail was the most useful tool, my group responded to e-mail (most of the time) but never responded to or acknowledged information placed on Trac. (male)*

While the number of responses is small, the message is clear. Groupwork was not found to be distracting and technology could minimize distraction. The 2008 students demonstrated that the use of technology had afforded them to be more collaborative than their predecessors with less social overhead than would usually be associated with physically-based group work. However, at the same time the introduction of a tool that is not immediately recognized or familiar to them added an extra learning curve. Educators need to take this into consideration by providing the opportunity to become familiar with the tool or try to adopt the same tools that students have used socially.

Web 2.0 technologies are often called social software. As such, they are expected to allow individuals to create and share meaningful content and collectively make sense of the world. Creating a shared understanding of the problem domain and a model of the solution were key activities to be performed by the teams in our case studies. While 21% demonstrated the pin-board affordances, the majority of groups did not use Trac for these sense-making purposes. Similarly Collazos et al. [Collazos, 07], found that the use of educational games, even one which involved collaboratively solving a puzzle and combining knowledge, did not result in students engaging in the "social process of meaning appropriation" which requires the design of "key elements such as curriculum, teacher's behaviour, mode of collaboration and interaction, tasks and learning goals" (p. 1030).

4 Conclusions and Next Steps

In 2004 we conducted a online survey study about student's learning behaviour and needs. From the 103 respondents we discovered that 28% of the individual student's time was spent working in collaboration with other students; while the same group of students expressed their desire to spent at least 60% more time in this collaborative working mode. However, the preferred form of collaboration was predominately face to face and within a formally allocated "class time".

Then, after the advent of Web 2.0 and proliferation of mobile devices; we looked in 2008 at how the students used a Web 2.0 tool in their interactions. This time, we imposed a requirement to use Trac, which is a web based tool that can provide the same functionality as a wiki, although it operates within a more confined social space, namely a single group and within the context of a project. There were 54 students in 11 groups in the Semester One 2008 study and observations were made through their online artefacts and reflective journals. The study observed that, students do utilize the technology to interact with each other; however each group did not use the technology in the same way as other groups. It was observed that there were four different types of technology used for group interaction. The most dominant type of usage was as a platform to facilitate exchange of messages and files. A minority used the technology to coordinate their activities. Only one group used the tool to deeply engage in collaboration involving every member taking an active part in contributing to the wiki.

Compared to the earlier findings revealing students' preference for face-to-face communication over an online mode of collaboration (38% in 2004 and 25% in 2005 [Bower, 05]), the cohort of students in 2008 were not inhibited to use the technology to interact with others; however, they did not optimize their use of the technology and failed to collaborate with high levels of social interaction. Much of their attention was directed to distribution of messages and artefacts.

The subsequent study in Semester Two 2008 involving a second year cohort of RASD student who participated as members of 28 groups, again through observation of student artefacts, revealed that 71% of the groups utilized more than one feature of the tool. However, the observations also revealed that 90% of those groups used the tool as a means of exchanging resources only. Only two groups utilized the tool for multi-way communication and exhibited high member participation. This overall underutilization of Trac was consistent with the earlier study in Semester One 2008.

What does this mean? Driven by various factors, students are increasingly receptive to collaboration in-the-cloud. This can also be observed in the professional world, where wikis have become key tools within organisations for knowledge capture and sharing. Tomek [Tomek, 01] even believes that knowledge management systems (KMS) should include a collaborative virtual environment (CVE) which emulates a physical reality by providing a space and objects inhabiting that space. Avatars would be used within the CVE to collaborate to achieve certain goals. The systems presented by Tomek demonstrated successful collaboration between students (incidentally involved in software development). Success was largely attributed to the sense of immersiveness experienced by the users. The work predates Web 2.0 and wikis and it would be interesting to see whether a wiki within a CVE or visa versa would lead to increased collaborative sense-making perhaps as a result of a feeling of being there together as is experienced in face-to-face meetings.

Lukosch [Lukosch, 08] notes that web-based collaborative systems currently fall short of the vision of "anywhere and anytime". Lukosch [Lukosch, 08] introduced the notion of a seamless transition between connected and disconnected collaborative interaction for nomad users, who can be workers and/or students who may move between workspaces and places. Incorporation of the requirements identified by Lukosch for nomadic use of collaborative systems into systems such as Trac may result in new affordances.

The closest work we have found to our work is the specification of a number of collaboration patterns by Schmeil and Eppler [Schmeil, 09] as a result of examining knowledge sharing and knowledge integration by groups using the CVE Second Life. Schmeil and Eppler have identified two usage patterns: the collaboration pattern and the learning pattern. They plotted each usage pattern across two axes which they call 3D added-value and design effort. Within those axes one can see how the pattern of uses are mapped out. Design effort is basically time and manpower utilized in the development. The 3D added-value dimension is more difficult to measure and the perceived value may relate to the uniqueness of the affordances specific to Second Life or 3D worlds more generally, but this notion is not considered in the paper. We conjecture that the extent of added value these affordances provided, depends on how much they matched with the needs of the learning process which the creator had in mind (intended). When the affordance provides what is needed, and the users are able to perceive and use that affordance, then the value-addedness would be manifested, and the intended benefits reaped.

Both activity theory and the concept of affordances are concerned with the way people interact with the world. However, while activity theory emphasizes the socially mediated aspect of group work, affordances emphasize how each individual within a group utilizes the environment to perform their contribution. A change in the form of activity is reflected by a change in which affordances are utilized. Thus, the form of group collaboration may be influenced if certain affordances of Web 2.0 tools are promoted. Furthermore, affordances can be aggregated at different levels to provide a fit with different levels within the hierarchy of activity (that is, common motives, individual actions and individual operations). Separate affordances which allow individuals to perform actions and operations may be combined to consider the way a group acts together. This is critical when considering Web 2.0 tools, allowing them to be discussed in terms of both individual action and group activity. For example, a wiki combines writing and editing affordances with affordances that allow distributed, open access. This combination affords groups collaboration in constructing an entry to the wiki. This form of collaboration would not be possible without each affordance, and allows a very different form of group activity than that allowed by each affordance separately.

Web 2.0 supported collaborative learning activities can be described from an affordances perspective. The activity is framed at the level at which an individual learner works within a collaborative group to produce a deliverable. The framework may be used to identify affordances to promote to groups of learners in order to align their collaborative activity with the forms of activity that match the learning outcomes. While activity theory allows us to describe the functions happening within collaborative learning activities, an affordances perspective allows a deeper understanding of how those activities may be supported by a set of Web 2.0 tools. Combining the theories supports analysis of group collaboration that details how student perceptions of the available affordances contributed to the form of that collaboration.

To explore the hypothesis that providing training in the Web 2.0 tool using an authentic task will allow its affordances to be realised is being explored in a series of other case studies across a range of study disciplines (Computing, Education and Creative Arts), covering undergraduate and postgraduate levels of study. These studies will try to discover the utilised and intended affordances as they are perceived from both the students' and teachers' perspectives during the learning design, in-learning and post-learning phases within each of the selected units. The outcome of the case studies is expected to provide a practical framework that will assist learning designers to match affordances of Web 2.0 tools with collaborative learning processes.

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12 Appendix D: Matching the affordances of wikis to collaborative learning

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Matching the Affordances of Wikis to Collaborative Learning: A Case Study of IT Project Students

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Abstract

The use of Web 2.0 technologies is increasingly common in many aspects of life: social, work, and study. The study reported here looks into how one type of Web 2.0 tool, the wiki, was being used to support groups of IT students involved in a collaborative authentic-task in their undergraduate studies to develop a software solution required by their "clients".

The study indicates the existence of a mismatch between what supports are needed by the students, with how they use the wiki tool to support their needs. The mismatch is not the result of a lack of technical skills or aversion to technology, but rather the lack of ability to perceive the affordance of the tool in meaningful ways to facilitate the collaborative activity at hand.

1. Introduction

In recent years, we have seen a growth in the numbers of Web 2.0 applications as well as an increase in the accessibility of those applications and services via mobile devices, together with the proliferation of sophisticated devices such as smart phones, netbooks, iPads and everything in between. We can't avoid using Web 2.0 technologies, regardless of whether we know or agree with what "Web 2.0" means. According to the 2010 Horizon report[1], people are expected to become even more mobile, technology trends are moving towards cloud-based computing, and people's work and study are increasingly becoming more collaborative. They are all the ingredients which will ensure that Web 2.0 gains a greater foothold in our way of life.

However, despite the prolific use of Web 2.0 tools, our investigations over the past two years show that, as with many other technologies, they are underutilized.

In particular, we have focused on the use of wikis as a tool for collaboration. We have observed that individuals and groups attribute certain affordances to the technology and they use the technology according to those affordances.

The case study reported in this paper concerns the use of wikis for collaboration by Information Technology (IT) students and is part of a larger study which includes two other case studies in the area of education. The aim of the study is to investigate the match between a set of web 2.0 tools and collaborative learning strategies to support meaningful learning within the context of problem solving in higher education from the viewpoint of the teacher and the student. Following this investigation, the aim is to create a framework that could assist individuals and groups to become more aware of the affordances of the tools so that they can use them to their full potential. However for this paper, we will concentrate on presentation of the IT student viewpoint.

This IT case study is particularly interesting because both the teacher and students are not technology adverse and yet real issues arise in how to effectively use the wiki for collaboration.

The Web 2.0 tool used in this case study is the TRAC (http://trac.edgewall.org) wiki and project management system, the collaborative learning process is the use of group work within the software project development life cycle, and the problem to be solved is the problem case given by the lecturer or industry sponsor in the context of the project.

The TRAC wiki offers a range of affordances that may be used to support collaboration. According to Gibson [11], affordances describe the possibilities of action between a person and an aspect of the environment and can be used to describe features of software that may support learning [2]. But we use Engeström's activity theory framework [8] throughout the study as the unit of analysis to guide our investigation at the level that is meaningful to the unit's learning outcome. We treat activity theory as the microscope through which we explore the notion of affordances and how affordances impact on technology usage. This is further discussed in the section 2. Our

[1] http://www.nmc.org/pdf/2010-Horizon-Report.pdf

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methodology is presented in section 3. In Section 4 we present the findings, and conclusions and future work are presented in Section 5.

2. Theoretical background

Whether we take an individual or inter-subjective epistemological view on collaborative learning, one thing that we can draw from both is that learning is a group activity which informs and influences individual learning [21]; this learning is essentially an exercise in meaning-making, done individually to form individual understanding, and collectively within a community to build knowledge. Hence at the community level, the process could be viewed as taking the form of "collaborative knowledge construction" [20].

Any collaboration framework designed to use Web 2.0 tools would then need to place social interactivity at its core. Activity Theory [8, 9] frames the collaborative activity by encompassing the social and cultural contexts of human activity, and allows a comprehensive explanation of social interactions and relationships.

Central to activity theory is the idea that the appropriate unit for analysis of human activity is an activity system which involves a group of people interacting and working together towards a common motive. Engeström [8] explains that the interaction would involve instruments used for production, sharing of artefacts, rules and customs governing the interaction between members of the community, and the division of labour amongst them. The interactions can then be categorized into four activity subsystems, which are: production, exchange, consumption and distribution.

Activity systems contain a hierarchy of social activity, individual actions and individual operations [9]. These relate to a collective motive, individual goals and individual conditions, respectively. Bærentsen & Trettvik [3] describe this hierarchy as explaining why, what and how the activity takes place.

Both activity theory and the concept of affordances are concerned with the way people interact with the world. However, while activity theory emphasizes the socially mediated aspect of group work, affordances emphasize how each individual within a group utilizes the environment to perform their contribution. A change in the form of activity is reflected by a change in which affordances are utilized. Thus, the form of group collaboration may be influenced if certain affordances of Web 2.0 tools are promoted.

Figure 1 depicts a Web 2.0 supported collaborative learning activity. The activity is framed at the level that an individual learner works collaboratively in meaningful ways to produce the required deliverable artefacts. Since the influences of web 2.0 tools permeate throughout the whole activity, hence the second triangle is added into the diagram.

The framework may be used to identify affordances and promote them to groups of learners in order to align their collaborative activity with the forms of activity that match the learning outcomes.

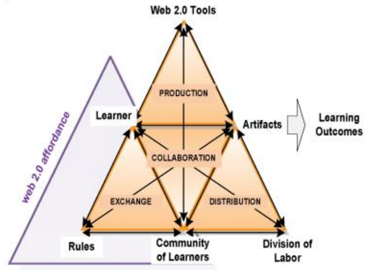


Figure 1. Activity System

Following the ideas of Leont'ev, Kuutti [15] presented the argument that an activity can operate at different levels, called: operation, action, activity (Figure 2), and the levels are recursive, which means for every action, there is an activity which that action is part of, and there are operations which comprise the action. This recursion is then constrained by the corresponding context, which are the goal, motive and condition. At any given time, each level can be a part of a larger integration of activities.

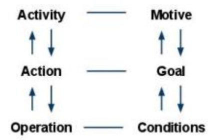


Figure 2. Hierarchical level of activity

On the other hand, Gaver [10] suggested that technology affordances can both be nested, where they collectively enabled the actor to do new things; as well as sequential, where the perception of one affordance would lead to the next. This same view can be extended into a higher abstraction of affordances, which is at the social level that is relevant to the meaning-making process of collaborative learning.

Therefore, affordances can also be aggregated at different levels within the hierarchy of activity (ie common motives, individual actions and individual operations). Separate affordances which allow individuals to perform actions and operations may be combined to consider the way a group acts together.

This is critical when considering Web 2.0 tools, allowing them to be discussed in terms of both individual action and group activity. For example, a wiki combines writing and editing affordances with technology affordances that allow distributed, open access. This combination affords groups social affordances [14] of exchanging ideas, coordinating work, etc, or in short "collaboration" in constructing an entry to the wiki. This form of collaboration would not be possible without each affordance which collectively affords a social environment, and allows a very different form of group activity than that allowed by each affordance separately.

Henceforth we can classify the affordances into two levels, the "technology affordance" and "social affordances", as seen in Figure 3. This framework guides this study by consciously thinking about the affordances which support each part of the activity within the collaborative environment.

However, Laurillard et al, [17] found that there are many times when students focus too much on the operational aspects of the tasks, or the navigational aspects of the interface, which – although necessary, they are considered to be less productive in contributing towards the learning of the content itself. Just understanding how to click a button or scroll down a window does not mean that you grasped the meaning of the contents in the window or even know why the command button gave the answer which appeared next.

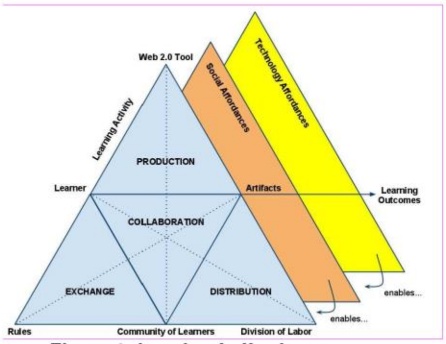


Figure 3. Levels of affordances

3. Methodology

The case study reported in this paper employed an action research approach. The unique position as unit convenor held by one of the researchers allows this study to have a deeper knowledge of the cohorts of students participating in the study but also necessitated the need for precautions to be taken to avoid "tinting" the samples [4]. Due to the situatedness of this case study [6], it must be noted that the findings of this case study may have limited generalization to other situations, which is the reason for the existence of other case studies in a different faculty (i.e. Education) as an attempt to later triangulate the findings reported in this paper.

Figure 4 summarizes and visualizes the research process carried out in this case study. All were carried out as planned except the "Nominal Group Technique" due to logistic constraints.

The IT case study involved cohorts of second and third year Computing students. The third year students work in teams on a year-long project, while second years students work in groups to learn the knowledge and skills to produce the artefacts that they will need to produce in their third year project.

The activity in focus in this IT-based study is the collaboration involved in following the industry's good practice and recognized standards to develop a set of desired deliverables, namely a software product and its supporting documentation. In order to follow the process and produce the product, students adopted several web tools to support their work. This study looked into those tools and how students reflect upon the use of those tools.

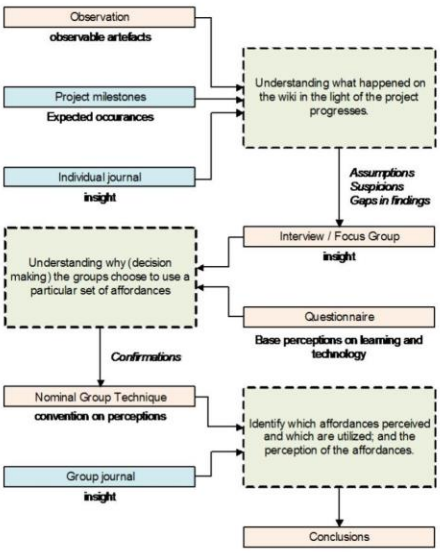


Figure 4. Research Methodology

Due to the nature of the tasks there are a range of tools that were in use e.g. TortoiseSVN for document version control, a system for job ticketing, and other programming and modelling tools to draw diagrams, schematics and writing the programming code itself.

The focus of all analyses performed was on data related to the students' approaches to collaboration, their actual collaborative activities and, in particular, their use of the Web 2.0 tool known as TRAC.

TRAC is a software development project support system, which started at the University of Sydney and has been developed as open source software. As stated in the documentation:

> *TRAC is an enhanced wiki and issue tracking system for software development projects. TRAC uses a minimalistic approach to web-based software project management. ... It provides an interface to Subversion, an integrated Wiki and convenient reporting facilities. TRAC allows wiki mark-up in issue descriptions and commit messages, creating links and seamless references between bugs, tasks, change sets, files and wiki pages. (http://trac.edgewall.org/)*

TRAC is designed as a collaborative tool and its usefulness for this purpose has been investigated by others. For example, [13] found that TRAC did support collaboration and that collaboration was "not worse" when TRAC was used. However, they also concluded that further research is needed to show whether the collaboration via TRAC is better than other alternatives. We have, however, not found any studies that evaluate collaboration using TRAC from the perspective of affordances.

We commenced our study in 2008 by collecting computerized activity logs, individual blogs, group discussion boards and written reports; we also observed and characterized usage of the wiki through the artefacts produced by the students. The IT case study involves three cohorts of second and third year Computing students. The third year students work in teams on a year-long project, while second years students work in groups to learn the knowledge and skills to produce the artefacts that they will need to produce in their third year project.

Consistent with action research, the research techniques we have used have been modified as new insights or gaps in the data have emerged. To find out why the IT students from two separate cohorts in 2008 were not using the technology most effectively, we felt the best option was to ask them. To this end, we developed an online survey to determine their reasons. To gain a deeper understanding and explore the issues more thoroughly we also invited students to participate in face-to-face interviews. The guiding questions used in the interview to gain insights into the students attitudes, experiences and usage of the wiki for collaboration are given in Appendix A. An invitation to participate was given at a compulsory lecture attended by all of the students. A follow-up email was also sent to elicit participants.

4. Findings

The IT case study has been conducted over a two year period. Commencing early in 2008, we observed two separate cohorts of students, the first involved 54 third-year students and allowed us to initially assess the students' usage of TRAC. The second cohort was 122 second-year students. In 2009, we observed a third cohort of 84 third-year project students. Observation and analysis of their usage of TRAC, has allowed us to identify the emergence of several affordances. We note that while there have been different students involved over that period of time; the findings have been consistent for all 2008 and 2009 cohorts.

The first cohort of 54 students, comprised of 11 groups, was observed over a whole year. During that time they had been members of two different groups. In the second semester new groups with completely new members were formed, that is, no team member was the same as in semester one. This effectively meant that we observed 22 groups from the first cohort over the whole year. The second cohort we observed were 122 second year students in 29 groups for six weeks. We were particularly interested to observe this group as they were in the process of learning the concepts they would need for their final year project and we would observe them again in the following year as they collaborated in the project.

Based on analysis of the collaborative activity in TRAC and related documentation such as reflective reports of both 2008 cohorts, it was clear that the wiki was not being utilized to its full potential and was used in different ways. With the incoming 2009 cohort of 84 third year project students, we conducted a subtle intervention in the form of a short video explaining, in the familiar context of a collaborative activity to plan a group outing, what a wiki is and how to use a wiki in general. Despite this, in the first half of 2009, the 2009 cohort continued to show patterns of behaviour consistent with previous years.

Summarized findings from each of the cohorts are presented next, with a focus on the rich data and insights provided from the in-depth interviews involving cohort 3.

4.1 Cohort one.

A total of 54 undergraduate students in 11 groups of 5 and 4 members, participated in the study in Semester 1 2008. The students were enrolled in a compulsory third year capstone unit [5] that aims to tie together their previous learning and prepare them to enter the workforce.

The activities in the project focus on: management, software development life-cycle, a set of deliverables and the final product. The case study gathered data from the groups' reflective journals, which is a written report worth 10% that requires the team to look at the processes they have gone through for the entire semester, considering issues and challenges they faced, what they had done and learnt, what worked and what didn't. Data was also gathered from the TRAC system logs and the groups' wiki pages to describe how each group has used their wiki functionality to support collaborations.

Through an iterative process involving text analysis we systematically analysed the artefacts produced by individual groups and examined the system logs to see how each member contributed in producing that artefact. The 11 groups demonstrated five patterns of TRAC usage, that formed the perceived affordances of the students:

1. The first category is the complete absence of usage (N=1) and realization of affordances. This occurred because of a technical incompatibility with the system they were building and they were given permission to use their own version-control system. It was unclear whether the product they were using was comparable with the TRAC Wiki. However, the group reported some difficulties in managing collaboration, such as miscommunication of responsibilities and difficulties in sharing resources.

2. The most basic and the second most popular (N=7) use of the wiki was as a communication medium. This utilization of the wiki supports the exchange activities (Subject-Rule-Community) of the group. Groups showing this pattern utilized the ***communication affordance*** (Kuutti, 1995) of the wiki. The dominant pattern-of-use is where a single member posts announcements for others. The exception was group 11, which used the wiki as a medium for bidirectional-communication amongst team members.

3. The most popular (N=8) use of the wiki for cohort one was as a shared files vault, where each team member or an appointed person uploaded files for later reference, a need that is driven primarily by the nature of the task which produces numerous deliverables that need to be shared and 'consumed' by others. The feature of uploading, storing and downloading files became the most popular use of the wiki to support the consumption activities. We refer to this usage as a realization of the ***file sharing affordance*** of the wiki.

4. A more sophisticated use (N=3) of the wiki was as a coordination web space. In this usage, wiki postings were predominantly done by a single group member, and positioned the wiki as a workgroup portal to access other parts of the TRAC system and shared resources. This usage pattern combined the affordances displayed by category 2 and 3 and utilized the wiki to provide a ***coordination affordance*** in facilitating the distribution activity of dividing (coordinating) task load amongst team members to produce the required deliverables (artefact-Community-Division of Labor).

Kuuttii [15] describes the 3rd and 4th usage as "automating", which the wiki affords to distribute documents and support the coordinator's role in the team.

5. The most sophisticated use (N=1) of the wiki was to create a collaboration web space, where the wiki has been personalized and multiple members contributed to the wiki. In addition to realizing all of the above affordances, they utilized the wiki to aggregate resources and personalize access. This use is much closer to the "sense making" function (Kuutti, 1995) which encompasses multiple sub-systems within the group's learning activity. Thus, we call this a ***sense-making affordance*** which may allow the group to gain a shared understanding of the problem; consider the merits of a range of possible solutions or to resolve issues, conflicts or misunderstandings which may arise.

4.2 Cohort two.

A total of 122 2nd-year undergraduates enrolled in a "Requirements, Analysis and Systems Design" (RASD) unit in semester 2 2008 were formed into 29 groups to work for 6 weeks on an assignment that involved the review and revision of a requirements document, creation of the analysis models and design models including the design of the system architecture, screens, reports and complex algorithms.

TRAC was deployed as a compulsory tool for the students to control versions of documents, but the use of the wiki or project management functions were optional, although they could earn bonus points. All but one group chose to use the TRAC wiki. As an aside, in the previous offering of this unit a year earlier, almost no groups had chosen to make use of the wiki so we could see a notable willingness of cohort two to use the wiki.

From analysis of the usage patterns of the 28 groups utilizing the wiki, most of the usage was one-way communication (***communication affordance*** to support exchange activities). This involved posting announcements, minutes of meetings, news and other resources, which was most commonly performed by one group member, usually the appointed leader or the person who had chosen to take on the leadership role (89%, N=25). Only two groups used the system as a multi-way communication tool by giving comments to each other posts and using the wiki as a discussion board.

Each group was given the same guidance and access to the wiki, but we observed different usage behaviours that indicated each team perceived different affordances of the TRAC wiki and utilized those affordances according to their needs.

Viewing usage of the wiki as the utilisation of affordances provides a framework for exploring the gap between the potential collaboration afforded by the wiki and the way the wiki was used.

A characteristic of affordances is their subjectivity because different interests or needs drive the discovery of different affordances. As we found in our groups, it is possible for an object of attention to have more than one affordance. We have characterized a number of specific affordances under three main types:

Subject-Rules-Community (Exchange): This communication affordance enables the members of a group to exchange comments (e.g. time availability) that do not necessarily contribute directly to the production of a shared object (i.e. the design documents), but are more to support the community itself.

Subject-Tools-Community (Production-Consumption): This affordance allows individuals to publish (produce) their work online and also access (consume) the work of others. We define two types:

1) File bucket – where files are uploaded, stored and downloaded. This was the most common affordance used by 57% of groups (N=16). Some groups categorized and structured the files and resources; others put everything on a single page, but they are mainly supporting the ***consumption activity*** of the group.

2) Pin board. There was a 21% adoption of the pin board affordance (N=6), which was mainly used to publish drafts or previews of the assessment deliverables and share those publications with other members of the group (***consumption activity***). Discussions and other information exchange can then occur around published documents. It is observed that, groups who adopted this affordance became more active in the adoption of the exchange affordances and have more communication going on in the team.

Subject-Division of Labor-Community (Consumption-Distribution): This affordance allows the group to decompose the workload into smaller (i.e. individualized) and more manageable workload chunks for which each group member would then be responsible. This was utilized by 39% of the groups (N=11).

4.3. Cohort three

Cohort 3 consisted of 84 undergraduate students enrolled in their final year project. The students were engaged in pre-determined roles [16] for the authentic task of developing a software application for a client. The application consists of several components and databases, which complicates the tasks and requires several students working together with different roles and responsibilities. The objective of the project was given, as specified by their client's Requirements Document; and the project management process that they needed to follow was specified in the theories that they had learnt in the previous units of study.

Most of the students in cohort 3 were part of cohort 2 in the previous year. Thus they had previous experience with TRAC as a tool to potentially assist with collaboration.

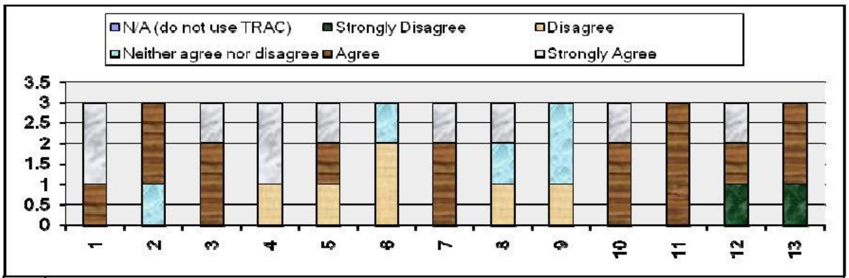
However, as mentioned earlier, despite being exposed to a subtle intervention involving a short movie clip demonstrating the use of wikis to perform a collaborative task, cohort 3 demonstrated similar underutilisation of the TRAC wiki for collaboration to the cohorts in 2008.

To drill down to the root cause we decided to conduct a voluntary survey and set of interviews. While we had 9 respondents to the survey, in the end, due to high workload of the project unit, only 2 students, representing two different groups could find the time to meet with us to participate in a series of two half hour interviews over the second semester.

4.3.1 Attitude towards the wiki. The survey questions shown in Figure 5 were deployed in all three case studies but have been adapted to fit the IT case study and the focus on the usage of the TRAC wiki. The survey seeks to gain the students' attitude to and perception of the TRAC tool and working in their group in general.

Students considered the wiki as a relatively easy tool to use, as they became quickly accustomed to the technical features. This is consistent with the fact that they are computing students, thus relatively more familiar with and more comfortable with using internet tools.

They also displayed a more positive attitude and a stronger preference towards using the wiki rather than doing things manually, but interestingly they liked to consider themselves to be less reliant on the tools (65%). Students believed that their usage of the tool did not influence their style in communicating with each other, but rather they were the ones who adjust and select the tool to match their own existing communication styles and needs.



1	I needed additional tools to support the development of the project documents.
2	I found it easy to use the TRAC wiki to develop the project documents online.
3	I can always substitute the role of the supporting tools with manual process.
4	I prefer to coordinate teamwork with my peers through the use of the tools rather than manually.
5	I would not have been able to collaborate with my peers as effectively as I did without the support of the tools.
6	I found that the tools were very useful for me to divide the workload with my peers.
7	In my group, I used different tools to communicate with different people.
8	I found that the tools we used have influenced the way I communicate and work with my peers.
9	I found it efficient to use the TRAC wiki to share the project documents I had produced with others.
10	In my group, I worked together on the same task with others.
11	In my group, I was uniquely responsible for specific tasks.
12	I have used some or all the tools in another unit before.
13	I have used some or all the tools for social purposes before.

Figure 5. Online Survey Results

4.3.2 Mismatch of affordances. The data collected from the indepth interviews reveals that "***automating***" and "***communicating***" [9] were found to be the easiest perceived affordances, and students were expecting that the wiki would provide those types of support. They also expected and found ways to use the wiki to support the process of exchanging documents, sharing files, or placing announcements and notices about schedules for their teammates. This is also consistent with the earlier studies. However, they lacked the expectation that the tools would support them in "***sense-making***".

This lack of expectation was not only in the use of the wiki, but extended to any other web tools which they were using. In contrast, when students were having *automating* and *communicating* breakdowns, they exhibited great concern and sought to find other tools which would give them those affordances in line with their perceptions and expectations.

> *"(TRAC) was down over a weekend or something and you're like okay, it's probably not going to be fixed until Monday so we'll have to go on MSN and try and figure something out to get this done. "*

In cases where they were faced with challenges which need to be resolved immediately, students quickly resorted to a manual process of meeting in person and having a discussion, rather than perceiving any other affordances of the tools. However, due to the high workload they have to cope with in the project, and the limited available time, physical face-to-face meetings were not always an effective use of time and resources. But by choosing to revert to manual processes, the group actually experienced more breakdowns along the way and some groups resorted to going back almost completely to the manual process of meeting face to face, while using the email system only to send documents and as a reminder.

> *"No, it evolved into email basically especially towards the end it was just all email."*

> *"We did use [the wiki] a fair bit to collaborate in a sense of just saying this is always the latest version of - when is the team meeting for example, when is the next sponsor meeting coming up, when is the next teleconference coming up and that kind of thing. So we also found it really useful for that kind of thing."*

Originally we thought that students can't perceive the affordances of the wiki, at a more meaningful level for their collaboration work; but the interview reveals that at the end of the unit, when they were asked if they could have done more with the wiki, they were able to reflect on the possibility to use the wiki to do more to assist them to collaborate and in particular to assist them with the sense-making processes and activities.

> *"Some of them [collaboration tools] would have been really useful. We went through probably easily a dozen versions. For example, the business requirement specification, measurement plan and some of the other documents and GUI design [is] another one. I'm not sure about the GUI design but certainly business requirement specification, probably the high level process ... a few of these other sorts of things; they really could have been done collaboratively on the wiki."*

This mismatch seems to be something that the students themselves did not realize. They did not necessarily think critically on the positioning of the tools to explicitly support such processes. In other words, the students were not considering what affordances they needed, and what affordances the tools could offer before they chose the tools. Once they chose the tool, they didn't seem to show any evidence of sufficient planning on how to make usage of the tools meaningful for their group.

It is all the more remarkable that such a mismatch still occurs even though the students have sufficient IT literacy and are familiar with the use of the tools.

> *"All these collaborative tools are great but there's a point at which you need to spend enough time, I suppose, to be familiar with what you're actually doing, what you're collaborating on and why you're collaborating on it as opposed to just doing it yourself."*

> *"A lecturer or a tutor or something goes through how to actually use it properly. Because you sort-of don't really use it. You know what you can do, sort of. But until you actually do it and you have the projects especially where you need to make use of that kind of stuff, that you don't really use it."*

Some students seem to lack sufficient motivation to put effort into the task itself, and hence they reduce their efforts to explore the affordances of the tools to maximize their collaboration. This contributed to the mismatch of affordances.

Another potential cause is the lack of experience in collaborating using technology, which is collaboration beyond just coordinating tasks and distributing workload. As suggested by one anonymous reviewer, there are further alternate explanations that can be offered for the lack of seeing wikis for sense-making. It is very common (even among educators, researchers and designers) to view collaboration technology primarily as a substitute for face-to-face interaction. This is reflected in the dominant theoretical paradigm of collaboration as being essentially information sharing, rather than a process that creates new information or knowledge in the interaction [7, 20]. The reviewer further notes that this view is also reflected in the common view of schooling as being about information transfer (from teachers to students, and hence, when students help each other, between students) and learning assessed individually, rather than about developing skills of collectively making sense of the world and building new cultural capital [1, 5]. So it is not surprising that, without specific guidance to counter traditional schooling and conceptions of collaboration, students don't see these potentials. We must also consider any cultural practices as practices of a community [22] and the learning process of one of enculturation, including learning how to use the tools that support the practices of that community.

5. Conclusion

We draw the following conclusions on the basis of the three studies we have conducted over 2008-2009 with IT students who were working in groups on a shared goal with shared outcomes including a common end product. Our conclusions in this paper are thus restricted to this special user group.

The decision for a group to use a tool is mostly on an ad-hoc basis. Other than the tools specified in the unit guideline, students start by using any tools which they have experienced before, and use it according to what they consider to be the best-fit possible. There was no indication of any in-depth planning process in their approach to collaboration. Frequently they do not make use of the full potential of the tool even when they know it has particular features that they are in need of. Such a situation leads to some mismatch of affordances, between the affordances that the tools offer, those they need and the actual affordances used.

They easily perceived the affordances which relate to the role of the tools to support *automating* and *communicating* processes, but not in *sense-making*. We argue that sense-making is the core and main reason for collaboration. Otherwise, they could work independently on their own part in isolation.

Hence there are some underutilized affordances, which the students may or may not have realized before. Just because the student knows how to turn a door knob, doesn't mean they know how to open the door. It is a matter of realizing the affordance at a meaningful level which is important for the successful use of technology to support collaboration. Following Kuutti's [15] argument that an activity can operate at different levels, we see a tendency to work at the operational level rather than at the level of the activity where the learning is intended to occur. This phenomena can also be explained with Resnick's work on socio-technical capital [18] which teases out the opportunities that technology in general, and the Internet specifically, affords to build what is called "social capital". Interestingly, social-capital is the "fuel" which stimulates collaborative activity, and social capital is also the by-product of a collaborative activity, if that activity is successful. Hence it is a renewable capital. Resnick [18] explains the need for social-capital to be consciously grown through collaborative interaction to fuel further collaboration. When a group has lower social-capital, they would have less trust amongst the members, and less eagerness to collaborate; hence the motivation for each member to perceive and exploit the available tools is reduced. Therefore, lower level technology affordances can be perceived, but not a higher level of social affordances.

As a potential means to remedy this situation we recommend that students need a trial run on the use of collaboration tools such as a wiki, with an authentic task to collaborate on, before they can perceive enough affordance to make their own use effective. Such trial runs can be built into the design of the assignment instructions, or problem statement in the case of these IT projects, ensuring also that enough time is given to gain an understanding of the problem and the way the tool can be used to assist the problem solving process.

The inability of the individual or group to perceive the affordances of a collaborative tool is a great challenge for those in charge of designing and utilizing cloud-based collaboration tools, and for teachers, students and others who could benefit from the collaborative assistance the tools can provide but who are currently unable to realize their full potential. The mismatch also poses interesting issues for researchers in a number of different disciplines looking at technology, affordances and (under) utilization.

Resnick [18] suggests that we can consciously design collaborative activity to grow social-capital, and argues that doing so by means of technology, hence socio-technical capital, would be more widely acceptable with the current internet-generation. Technology is seen to offer the following affordances: removing barriers to interaction, expanding interaction networks, restricting information flows, managing dependencies, maintaining history, and indirection of naming. Resnick's work emphasizes the fact that there is a strong reason to study the activity of collaboration to make conscious investment in building the social-capital. It would be interesting to examine his subsequent work in measuring social-capital to see how those measurements can be integrated with Activity Theory, which can quite possibly, in the future, be used to create an in-built measurement for any Web 2.0 tool.

A key goal of the case studies we have been conducting is to gain a greater understanding of how to match the perceived affordance of the collaborating team members, and to influence this perception to allow effective and meaningful use of the tool to solve a problem. In the longer term we hope to develop a framework to allow people to identify the affordances they need to perform a certain activity and how to find and utilize the affordances in a supporting technological tool. This will allow teachers to better plan learning activities using supporting technology and students to realize the affordances.

Acknowledgements

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Appendix A: Semi-structured interview questions

IS#	Guiding questions
01	What aspect of the TRAC wiki did you find easy to use? And what difficult?
02	What additional tools did you use to support your effort to produce the project documents? And why do you choose to use those tools in addition to / to replace the tools provided?
03	How did your group go about working together on a single task?
04	How did your group go about dividing and assigning the responsibility?
05	How would you describe your team's collaboration?
06	How would you see the value of the tool in general? And the TRAC wiki in particular? What would you define as effective?
07	What kind of sharing is sought after and valued in your perspective? How did the wiki and other tools support that needs?
08	How much do you value the tools? What was your perception of the role of the tools in supporting the team's collaboration?
09	Did the sub-group formed out of communication preferences? What tools causing this division?
10	Did you make any adjustment in your communication style and your attitude towards group work after using the tools? What adjustment was made? And why do you feel you need to make such adjustment?
11	How familiar are you with the tools within social and formal learning context?

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13 Appendix E: Research Output

Between the commencements until the submission for examination of this study, the following conference presentations and publications were produced to put forward concepts, findings as well as arguments:

Kuswara, A. U., & Richards, D. (2011). Realising the Potential of Web 2.0 for Collaborative Learning Using Affordances. *Journal of Universal Computer Science*, *17*(2), 311-331.

Kuswara, A. U., & Richards, D. (2011, 4-7 Jan. 2011). *Matching the Affordances of Wikis to Collaborative Learning: A Case Study of IT Project Students*. Paper presented at the 44th Hawaii International Conference on System Sciences (HICSS).

Bower, M., Hedberg, J. G., & Kuswara, A. (2010). A framework for Web 2.0 learning design. *Educational Media International*, 47(3), 177 - 198.

Bower, M., Hedberg, J., & Kuswara, A. (2009). *Conceptualising Web 2.0 enabled learning designs*. Paper presented at the Australasian Society for computers in Learning in Tertiary Education (ASCILITE 2009), Auckland, New Zealand.

Richards, D., & Kuswara, A. U. (2009, April 22-April 24). *Learning to collaboratively design software systems*. Paper presented at the 13th International Conference on Computer Supported Cooperative Work in Design, Santiago, Chile.

Kuswara, A., Cram, A., & Richards, D. (2008). *Web 2.0 supported collaborative learning activities: Towards an affordance perspective*. Paper presented at the 3rd International LAMS & Learning Design Conference, Sydney, Australia.

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14 Appendix F: Case 1 Data

The following are tabulated questionnaire data and interview collected for Case 1. The list of the questionnaire questions can be seen in Appendix A: Research Instruments.

Questionnaire response

Respondent:	PS	AS	AB
Qn 1	Agree	Neither agree nor disagree	Agree
Qn 2	Strongly Agree	Agree	Strongly Agree
Qn 3	Strongly Agree	Agree	Agree
Qn 4	Agree	Agree	Agree
Qn 5	Strongly Agree	Agree	Disagree
Qn 6	Neither agree nor disagree	Disagree	Neither agree nor disagree
Qn 7	Strongly Agree	Agree	Agree
Qn 8	Strongly Agree	Disagree	Neither agree nor disagree
Qn 9	Neither agree nor disagree	Disagree	Disagree
Qn 10	Disagree	Strongly Agree	Strongly Agree
Qn 11	Strongly Agree	Strongly Disagree	Agree
Qn 12	Agree	Strongly Disagree	Agree
Qn 13	Agree	Agree	Strongly Agree
Qn 14	**TRAC** wiki + TortoiseSVN (repository for the project development) + email Easy to update/edit/modify, annoying to log in each time	Main tools would probably be email. It was easy to use because everyone had used it before but it wasn't the greatest tool to use. If you went looking for a document you had to search through your entire inbox. Not very efficient.	We use SVN, Trac. No aspects were really difficult perhaps a bit of a learning curve with **Trac** and SVN
Qn 15	Standard MS Word/Excel/Powerpoint docs as needed. Sybase PowerDesigner 12.5 for extensive database modelling. Enterprise Architect for limited use case/state diagram modelling. MS Project for some initial task scheduling. LucidSpec for GUI/Design modelling (terrible tool, waste of time) Eclipse + Spring Framework (JavaEE) for actual development. Chosen partly because of sponsor requirements, partly because of team experience (both good and bad).	**Trac** wiki and SVN were also used. The **Trac** wiki was very good at centrally organising information, albeit under-used. SVN was extremely helpful in handling the code as multiple people could easily make changes at the same time and the back-up was automatically handled.	Email, Document versioning in Word 2007

Qn 16	Divide and conquer mostly - try and develop to stay out of each others' way. Where collaboration was required, was mostly discussed in team meetings, ideas considered and a member elected to develop a draft, then more debate/discussion as needed.	We had a group meeting and brainstormed. Then we made decisions and documents as a group and assigned tasks for each person to complete.	We would meet formally establish responsibilities in the single task, share information via email, telephone as well as TRAC, then meet again to pull the document together
Qn 17	We have x documents or screens to produce. So we get about y each, more for person A because he has experience, a little less for person B because he has much more limited experience or more work commitments.	We initially divided tasks to a person who was either strong at or enthusiastic about doing that task. The remaining tasks were split amongst people according to workload and skill sets.	We did this via formal meeting and comparing our groups current workloads and schedules
Qn 18	Wish it could have been better, would be slightly easier if team members had picked up the core ideas behind enterprise Java development/Spring Framework more quickly.	Adequate but could have been much better.	Our team's collaboration worked very well. There were no instances of conflict within our group and we discussed everything rationally and if necessary used conflict management techniques. We also had a Group Leader which we rotated through the project who was the final arbiter of conflict (which was minimal to say the least if non-existent)
Qn 19	Tools in general are extremely valuable - the project simply would be a lot less valuable if they had not been used. **TRAC** has incredible potential where team members are both willing and able to understand and use it. It is said "you can lead a horse to water but you cannot make it drink". Our team would have benefitted a lot more if team members had been more willing and more available to collaborate effectively rather than going off on their own tangents or letting themselves get bogged down in minor details or otherwise losing sight of the bigger picture, identifying their impedances and doing their utmost to overcome them.	Email has very little value, apart from a reminder message. The **Trac** wiki was great, easy was to collate information.	The tool is valuable both as a backup device and in its usage for versioning control. The value of **TRAC** wiki is not held in that high regard by me as there are other freeware products out there that achieve the same functioning. Effective I would define is a product that fulfils a user's needs as well as brings down workload

Qn 20	I get the impression everyone is too busy either completing assignments in other subjects or playing games.	Sharing where information that helps other team members to perform their duties. Allowed to share documents and info.	The most important kind of sharing is quick and efficient sharing where a user can use one tool to collaborate with the group. This is what is valued in my opinion. Wiki and other tools support those needs by providing a place store documents, as well as providing versioning control and an ability to compare documents through editing and comparisons
Qn 21	Tools were absolutely critical. Email allowed me to explain things and point to the **TRAC** wiki with reasonable confidence team members would understand my contributions to the project. Other tools like PowerDesigner/EA allowed us to develop models to explain what was going on easily and identify the core of those issues. Development tools were absolutely essential to creating working code and making everything work together. TortoiseSVN was perhaps the greatest teamwork enabler.	Highly. Extremely important. Especially when there is no face-to-face class so unless we organised a meeting, we would not see each other so the tools were the only other method of communication.	We valued the tools and I believe that the same perception was held by my team mates
Qn 22	I liked email a lot, just was more convenient for me. Nevertheless I was probably still the most prodigious user (as little as that says) of our **TRAC** wiki, I believe it was only used by others to either briefly generate user stories or to upload meeting notes in a more readable format than email.	Yes, clearly email was the simplest (and laziest) choice. The **Trac** wiki was used by one or two members, the same for SVN. As others saw the value of the other team members using the tools (and how easy they were to use) adoption increased.	No not really. We relied primarily on formal meetings, email and TRAC
Qn 23	Really tried to develop an agenda before team meetings so that people got stuff out of it, tried to motivate them and keep them interested but well I'm not good enough of a manager yet or the students I was with simply weren't self motivated enough...	The use of TRAC/SVN made you feel more like part of a team. Working on a real project.	No we did not make any adjustments we started using the tools at the beginning of the project found them effective and carried on using them

Qn 24	Email - Social mostly + some learning (main project sponsor communication mechanism) Teleconferences - As above. EA/PowerDesigner - Learning mostly, social through communicating in the diagrams produced. Eclipse IDE/Spring - Pure learning really, the code is arguably independent of the IDE. TortoiseSVN - social - sending stuff to everyone. LucidSpec - Learning I guess MS Word/Excel/Powerpoint - Learning/sponsor communication	Email: both and yes. Trac: learning, mainly learning but you could use it as a personal project planner or something? SVN: learning. I would only use this as part of a development project.	**TRAC** - learning purposes Formal Meeting - learning purposes Email - learning and social purposes

Interview transcript

Interview PS

Facilitator

Emails are part of it, so maybe the first question will be you obviously collaborate within your group at that time and, so what form was the collaboration that took place? How was the collaboration working?

PS

The collaboration was more to really organise things and that's typically how we found it a lot easier to work is to give everyone their own screen to work on for the project is that we were creating a leave management system for Cochlear so that's got several different screens and we could all work on our own screens and try and discover things. We found that seemed to work better because there are enough shared filed anyway, things like navigation bars that have certain things on them which are included in every page. There's a messages-properties file which contains essentially every message that is presented to the user anyway. So the idea of that is it makes internationalisation easier.

If you want to translate the system with exactly the same functionality to be into English and French then all you have to do is translate the one messages-properties file to French and include that one instead and the functionalities are all the same so essentially you don't have to maintain two different code bases and that kind of thing. That has the issue that if someone wants to change something, say they need to insert a new message because they wanted to add functionality to their screen then everyone obviously has to update their version of that file.

Most team members did pretty well at it and they followed the procedure that we established early on which was to essentially rebuild their development work space every single time they wanted to do something. That seemed to work pretty well. Certainly, one team member had some trouble with that. We kept telling him please rebuild your work space, you're overriding files that people have updated and so that didn't go quite as well as it could have. So that was sort of an impedance to collaboration which is just the ability to let go of the past or to update to the future, however you want to describe it.

Facilitator

What tools do you use to support the collaboration?

PS

In terms of that, we all used separately the Eclipse [unclear] and development environment … methods of collaborating. We used TortoiseSVN to actually maintain group work space that was supposed to be the working integrated work space that basically everything was supposed to be working that we had decided to implement in that. So, generally speaking, we were able to maintain that but …

Facilitator

What was the work space name again?

PS

The software we used to develop or the software we used to collaborate?

Facilitator

To collaborate.

PS

To share the files it was TortoiseSVN so we used that as essentially the code repository but we …

Facilitator

That's the one that's on the course …

PS

Yes.

Facilitator

Did you use the wiki for it?

PS

Yes we did.

Facilitator

How did you use the wiki?

PS

We used it to store documents for things like the rebuild process because there's quite a few steps to it, just to go basically from just the code and an empty version of Eclipse to the fully functional program basically. That was the only thing to be able to, if you couldn't do something else, like if something failed or just wasn't working you would be able to say the work space has been verified to be working by someone when they checked it in so it should be fine. You should be able to check it out and rebuild and have something that's working that you can proceed forward with.

I think for the most part that works pretty well. Most team members were quite capable of doing that so is that what you ...

Facilitator

Were there any difficulties the first time when you started using the wiki?

PS

Not really. It's a wiki. If you know how a wiki works it's all links and text. If you know how to create a link and you know how the text works it's easy. I used it quite extensively. I put lots and lots of stuff up there and things like that ... other things like how to write a presentation on a page just in case someone needed it. What else is up there? Request handling which is a really basic level. So how the whole workflow process of your [client] sends a request to the server and what does the server do with that? So I can describe that to you. It's just details so just lots of little pages like that which I put up there.

Some of the people put things like; we call them user stories, because we used an agile scrum approach. We call them user stories so they might be like a user would like to place a new lead entry into the system. So it's just a simple user story and another one might be easier to modify an existing lead entry. That was another thing that one of the team members contributed to there.

There are other things. We didn't use it as extensively as we could have, certainly, but there's a fair bit of stuff up there so we found it quite useful I think.

Facilitator

What do you think that you can do more with the wiki that you probably haven't done?

PS

It's a good question. What we really probably should have thought about from an earlier stage is whether we could have moved a lot of the documents - whether we could have rethought the way that we did documentation entirely but this is something which we can only really say in retrospect. Whether we could have developed the documents essentially on the wiki itself.

Facilitator

Use the pages?

PS

Yeah, and then at the end just copied it all out into a Word document or something as required.

Facilitator

Were there any process that the document, or pages of the document you have to collaboratively work on?

PS

Some of them would have been really useful. We went through probably easily a dozen versions. For example, the business requirement specification, [unclear] measurement plan and some of the other documents and [Gui] designed another one. I'm not sure about the Gui design but certainly business requirement specification, probably the high level process … a few of these other sorts of things, they really could have been done collaboratively on the wiki. Actually, leaving out the diagrams. The diagrams are a little bit harder because I don't think it's got any in-built sort of - if you had Enterprise Architect in there or something or even Visio or some kind of modelling tool, then that would just be really, really good. That would be phenomenal but just because we use diagrams so much from ISYS227 …

Facilitator

How did you do that … started doing the wiki?

PS

For those we said, okay, let's - one person just assigned responsibility for the documents so they go away and create something and then we bring it back and we have a team meeting and we discuss it and we say how could this be better? What is it actually telling us? Is it telling us what we thought it would tell us? Is it answering the question? All that kind of stuff and most of the time it doesn't so you say, how can we fix it? How can we make it better or whatever.

Facilitator

So somebody would take it away and then work on it and they'd bring it to a meeting and discuss it?

PS

That was the idea and goes through a few iterations like that.

Facilitator

At that time what was the wiki function for, is it storage?

PS

We did use a fair bit to collaborate in a sense of just saying this is always the latest version of - when is the team meeting for example, when is the next sponsor meeting coming up, when is the next teleconference coming up and that kind of thing. So we also found it really useful for that kind of thing.

Facilitator

Was everybody working from their own wherever they are, remotely or you actually got together?

PS

It was sort of here and there because the other thing, it took us all to get working was to get the database working over wireless but that's a non-collaborative sort of thing because we couldn't do as much work as we might have been able to do at uni which would have been useful to have figured that kind of thing out earlier. We did get it in the end.

So in terms of collaborating, one thing we found really useful, not so much in the tools but in the process was just to basically sit side by side and have one developer explain what they were doing and the other developer comment on it and that's something which isn't really documented anywhere. It was something that we found really useful. I think they call it paired programming in the agile scrum methodology.

Facilitator

So … commenting on each other?

PS

Yeah, well, usually one person … the other or the other way …

Facilitator

In pairs or …

PS

In pairs usually.

Facilitator

So how many was it in your group?

PS

There were only four team members in our group so we would have benefited a lot from having five or six to be honest with the scale of this project but anyway it is what it is.

Facilitator

What are the tools that you used other than the wiki to collaborate? Especially the managing …

PS

In terms of collaborating itself, we did use MSN for a bit, messenger to send messages back and forth.

Facilitator

Online chat?

PS

Yeah, online chat basically so it's MSN messenger.

Facilitator

Is it like crucial …

PS

It's an instant messaging program so if you send a message …

Facilitator

Does it play a significant role?

PS

It did for some of those documents because we weren't really sure where we were going with this document and what was really expected of us. One person would bounce a question off and everyone ... would say that sounds like the direction to go in and so let's go in that direction for a while so there are a couple of documents on - this is like three months ago.

Facilitator

Then file through the MSN as well?

PS

You can send files through MSN. I don't think we did.

Facilitator

Just text discussion ...

PS

Yeah, because we just used Tortoise that handled everything for files and obviously then it's all a permanent record that you can't accidentally erase it or lose it or that kind of thing. The worst case is you just have to hunt down the revision history so where people have good comments.

Facilitator

Do you think that tools, in particular the wiki component is it valuable to working on the team?

PS

I think, if nothing else, from the organisation perspective, yeah it's been quite useful. It would have been nice to be able to rely on it a bit more because, certainly early in the game, it was down two or three times ...

Facilitator

The server?

PS

Yeah, the … Tortoise was down over a weekend or something and you're like okay, it's probably not going to be fixed until Monday so we'll have to go on MSN and try and figure something out to get this done. So that was a bit annoying but that's something you deal with.

Facilitator

Was that the reason why you used MSN because the system was down at times?

PS

It wasn't the reason we used MSN but it was something that we found MSN useful for, so we did actually use it independently of that. A lot of it was just normal email, you know, there's a meeting on at this time and you update [track] but you also just send an email to people …

Facilitator

Reminding them.

PS

Yeah, this reminder here.

Facilitator

Was it the first time you used wiki obviously …

PS

Personally and for at least one other team member, definitely not because we used it for ISYS227's group project last year.

Facilitator

The same track wiki?

PS

Yeah, second semester last year.

Facilitator

… added value?

PS

I'm not sure. I don't know honestly if they used it. I just couldn't say.

Facilitator

Do you use wiki as well outside - not exactly that wiki but other form of wikis?

PS

Yeah, I use at least two. I use wikis all the time for stuff and I've contributed to at least two wikis that I can think of. The main Wikipedia - what was it - it was something on joining tables in SQL. The documentation was so terrible on it so I thought I would throw an example up and if someone else wants to improve it they can improve it. That's the idea of wiki, isn't it?

Facilitator

Yeah, so you have been in the wiki environment where everybody collaboratively composed something or contributed a piece of work?

PS

Yeah, well the other wiki which I've contributed to, which is no longer maintained by anyone, was a listing of server progression. I play a game called [Walder Walcroft] and as part of that there are people who like to compete and they like to know where they stand relative to other guilds on the server so that's one thing.

Facilitator

Keeping up their scores.

PS

That's one thing you do is you update your guild score and obviously lots of other people are usually doing that at the same time or at similar times. Not exactly at the same time but at similar times.

Facilitator

Was it, in that sense, the wiki can give any unique support that you would otherwise you can do without the wiki or something unique?

PS

I suppose it enables you to have something which is generated essentially from many, many people's contributions rather than just a couple or a small number of people so that's one of the other reasons. With four team members I think we're right on the line between being able to really break it up and work individually on different pieces. So we didn't really have to think about really forcing collaboration … and there are a lot of other places where because of a combination of lack of planning and just running out of time. I suppose you could call it the god project or whatever you want to call it. I don't know how to describe it. Essentially it's this huge page that everyone's supposed to contribute something towards. What perhaps we should have done for that would have been to - this is where we all just ran out of time at the end as we always seem to. Just because people were supposed to get stuff done by a certain date and it slipped and slipped and slipped and then suddenly I suppose I've got to clean it up so I ended up doing 90 per cent of it. One team member did contribute some stuff too which was good but the way we should have done it is said what are the elements on the page and how would you do this piece of code or that piece of code and just see if we could have divided that up.

I suppose, the real problem is just that no one in the team had ever done anything collaboratively before. The real problem I suppose is that no one really knows how to put all the pieces together. Essentially what we ended up doing is one person would usually be responsible for putting their pieces together and then that would be a particular page so that way it's separate out generally from everything else. Basically a lack of experience with how do you put pieces together, that really was [unclear] so the least risk option for us was just to say work on it separately and see what you come up with, I'll see what I come up with and we'll compare ideas and see if we're going in the right direction.

So we would have liked to have collaborated a lot more but we're dealing with stuff like you have to have a certain level of foundation. You have to have a certain foundation to build on just to even get to this level. Basically to build the pieces that you need to fit together but then there's the actual fitting them together.

In terms of, as I said, the actual fitting together, we'd have to communicate with each other a fair bit about things. For example, one team had decided to use a different database to everyone else which meant that every time that we needed to update that particular file that described that database like - because if it describes the database and describes what we call the object relational mappings from our domain objects in - we use the spring framework so this object relational mapping between our domain objects and the database tables and obviously if you've ever logged onto any database you'd have stuff, there's a mismatch between the relational database and object or typically anyway. Essentially every time you need to define your object or a new set of mappings or something like that that person would have to update their file mainly on there as well. In addition to that it was another contributing thing to problems so, just lots of little things like that. It's just because we really haven't worked on - the coding … was kind of a project I don't think anyone in the project had experience with that kind of thing so it was just dive in and try and make it work.

Facilitator

So when you collaborate like that obviously there are so many little things that you are trying to cope with and issues as well and each time you solve certain things or you're facing certain challenges there's a different way of doing it or there's a different way of you resolve it and bring about it and did you actually use the wiki to track all those issues or resolve them?

PS

Most of the time it was either in team meetings or it was in … saying I needed to make this change, is this going to be a problem for you sort of thing.

Facilitator

Short messages?

PS

Yeah, short messages and so that's what we found easier. The real thing about it is because we had no experience with the stuff before we weren't really sure if we were going in the right direction, if either person was going in the right direction, until the whole thing sort of works together.

You move it to something which is probably better but you can't be 100 per cent sure until you see it all working and say okay and now you can see all the pieces fitting together so that's the point at which you say great, make it happen. I don't think most of the team spent enough time on it to really gain the benefit of that kind of tracking of all the stuff as well. I'll have to check on it but I think I'm probably the only person who actually used any of the tickets on track to be honest, used the tickets as just another little reminder. It's just another little reminder thing to say you should update this if you get time sort of thing.

Facilitator

So you're … to yourself to track your own, whatever …

PS

I did to just say, I want to make sure this SMS is done so …

Facilitator

Nobody like to send … gets to somebody else …

PS

I told them send me a ticket if you find problems sort of thing but they liked the email better so they sent email and it's like if no one wants to use the tickets just tell me and we'll just keep going with email.

Facilitator

Why do you choose tickets rather than email and the other emails than tickets? Why was the difference?

PS

I honestly don't know. I guess they've just never used a system like that before and they didn't understand it. In the absence of the group acting together to say let's use this system or that system, it's really difficult to push something like this forward. I suppose the other thing which was a real problem was just - and I'm not sure whether it's general student apathy or maybe because the spring framework has got a very steep learning curve but people didn't seem willing to dive in and say today I'm going to make this work, I'm going to do whatever I can to make it work.

Maybe one person that I really see that sort of come through as that's the spirit, I'm here to make this work, I'm going to do whatever I can to make this work, sort of thing, I think that was also a significant barrier. It's like this is another little tutorial type thing I need to get done and I'm going to work on my little piece and hopefully that works type thing. Not I'm going to do whatever I can to see this working so that was a big impedance as well.

All these collaborative tools are great but there's a point at which you need to spend enough time, I suppose, to be familiar with what you're actually doing, what you're collaborating on and why you're collaborating on it as opposed to just doing it yourself.

Facilitator

So you see yourself or the other members in your team the way - did you actually come up with an agreement on how you collaborate before?

PS

No, it evolved into email basically especially towards the end it was just all email.

Facilitator

Was there anybody who initiated the use of a wiki in the group?

PS

I guess it was all me. I put stuff up and I asked people to put stuff up and they did it or they didn't do it and I complained if they didn't do it because they were supposed to type thing.

Facilitator

Were they contributing as well to ...

PS

Yeah. I tried to say this is a wiki, if you see a problem when you're reading it, fix it. That's the idea and everyone kind of knows everything.

Facilitator

Then they all start using it?

PS

That's the idea. Of course, if students don't want to work it's like the old saying you can lead a horse to water but you can't make it drink.

Facilitator

So there were changes in the way people were originally collaborating maybe through email and somebody, or you in this case, suggesting to use a wiki and people changing?

PS

You could try to do anything that needs to change frequently and especially if it's in pure text you did. That was the kind of thing you emphasised. Certainly something like the requirements expect that, is something I think would have done really, really well in a wiki-type format especially in the early stages of developing that kind of thing just because you're basically throwing ideas all over the place so that's a perfect thing for a wiki. You're rarely using diagrams on that kind of a level as well so it's like the [scope] diagram and what else? The [Yaris] or SRS. I think it's just like the [scopal] context. That's all you usually see in it so it's basically pure text. That is a perfect thing for the track wiki. It really needs some kind of diagram-type tool for it to be used in a lot of the later documents. Or, at the every least, an easier way to put an image in. If there was a way that I could click a button and then take a snapshot of something or I could do something like that then, as I've seen in - you probably haven't used this kind of a tool but I use a tool called HP Quality Centre at my work at [Dewar] and that allows you to do that kind of thing. If I want to take a snapshot or a screen shot of just a particular window on my desktop, for example, then I can do that or I can - just like a particular part on my desktop or just the whole thing or whatever.

Facilitator

In the [unclear] you can upload images as well?

PS

I never tried but if you can then probably you upload it to a third party website like Imageshack or Photobucket or something and then you link back to it and that's like, who's going to do that? No one does that. To be honest, that's probably all you need because once you've got that then you can be, like this is my latest EA, like

Enterprise Architect, diagrams so what do you think about this, and it's like okay that's where's this case or whatever and it's like I didn't think about that in this case but that should probably be included or something like that, so a conversation starter-type thing. There weren't really too many just pure text-type documents like system architecture is mostly diagrams, [unclear] design is like 90 per cent of the diagram is basically - there's plenty of explanatory notes on those diagrams but it's basically all diagrams.

Facilitator

So you're collaborating on documents such as those, there were a lot of conversations around the diagrams that couldn't be facilitated by their wiki?

PS

Yeah, well, it's not feasible to do that kind of thing on a wiki. The way that we ended up doing it between ourselves and our sponsors was two people basically maintained the document. We used a tool called Lucidspec, I believe. I don't know the details of it because I never actually got a licence to play with it. I'm not sure how they got a licence so they used that particular tool. That had other issues in itself because it's a tool that's designed for Windows application development not web application development and it's a whole different sort of style of what you actually get and what you typically do, the kinds of workflows that it represents. There's no real concept of a what a link is in that particular tool and that's obviously the fundamental architecture of the Internet. Everything's linked.

Facilitator

... for drawings, for diagrams.

PS

Yeah, it's useful in the sense if you want to put a box or something on the page then it will do that but it had a lot of issues and it didn't do export to Microsoft Word easily as far as I know which was a real problem. There was quite some kicking and screaming and make this tool work type thing. It was anger at using that tool so what we should have done honestly for the designs was - and this is something we should have done - dive into the actual, how do you write a JSP, a Java server page, and say this is just a screen, it doesn't have to do anything. It just has to look right so can we dive into that and make it look right? That's what we should have done but anyway, so in terms of collaborating on that it's the same sort of thing. It's like if we dived into the technologies earlier we would have had those shared experiences, we would have done a lot better I think.

Facilitator

So you will be uploading a lot of different types of files to the wiki as well, you can attach file?

PS

We only did that very briefly because the attach file has a 250 kilobyte limit. I'm not sure if you're fully aware of this but what we did to distinguish between the wiki, which we call track and the SVN which we call TortoiseSVN, was just basically to call them those so we call I the track wiki and TortoiseSVN where we store all the files, the code base and documents and so on and so forth simply because that 56K limit you don't upload something as say like a ticket to someone else and say can you look at this. You would say, if anything what you should do is you would upload the file to the SVN and then you would submit a ticket to someone saying can you go and check this out sort of thing..

One other tool which we didn't look into but which probably would have been really useful to get going would have been to see if the ticket system, or if there was a tutorial or something, the ticket system being able to send automatic emails like an email saying user whatever has submitted a ticket to you, can you go online and check it?

I don't know if it does that but it probably does, it's got a lot of other features which are like this. That would have been something that would have enabled us to actually use tickets effectively but we sort of defaulted the email and a combination of factors we didn't really use the ticketing system. The advantage of using a ticketing system obviously is people lose emails, they forget about them, they read them once and it doesn't stick in their mind because it's read it's just forgotten. It's in the past.

With a wiki, until you physically say that ticket is closed, it's assigned to you, you've got to do something about it. It's that call to action as such that someone has said you need to look at this. It would have been a much better way to look at the workflow …

Facilitator

People need to adjust to see and yourself or people in your team, do you see that they need to adjust to work according to … to get this wiki where you - a central space unit to update yourself or your status and then there's an SVN?

PS

I suppose the other thing about it is having to log in every single time. As far as I know, it's an insecure login as well because it's a pop-up box, would you like to enter your details, how can that be [ACT**PS**]? I don't think it is. So that's also a little bit annoying but that's because I'm into security to some extent. Most people are like, it's asking me for something I'll just enter it.

Having to log in is an issue. It would be really good if that could be linked into some kind of single sign-on mechanism for students.

Facilitator

To the students' accounts?

PS

Yeah, to the students' accounts and that would be absolutely phenomenal but that's just another little thing that sort of detracts from the use of these particular collaborative tools.

Facilitator

It's a separate system at the moment?

PS

As far as I know it's a separate system. It's okay the first time but it's not going to become something that I think most people are going to check every single day and be like what's the latest that I need to know about and that's what you really want it to be, like a piece of infrastructure that you're just like if I go to track and I am logged into my normal student account it should just take me straight there. If I'm at home or something then I understand the need to log in. Whether you do that by browser cookies or something I don't know but considering the current security on the thing they might as well implement some kind of browser cookie that does that, choose one or the other. Might as well make it easier to use if it's not going to be secure.

Facilitator

The last question is if you are supposedly in a real project environment - obviously in this situation because they are students probably they're not that engaged on a collaboration thing but if it is a real project, and you have this team or a new member that never used a wiki or never used any functions of the collaborations before, the supporting tools, how would you tell them about these tools? Is there something that you would like to convince them that this is a good thing to use?

PS

What I would probably do is I'd ask them what type of a learner they think they are. So there's three types of learners. There's like auditory, visual and kinaesthetic, I think, so I would ask them what type of learner they are, based on that and then I'd probably try and walk them through a tutorial based on what kind of learner they thought they were, ideally to keep them in control especially if they're a kinaesthetic person but to give them a sense of what we use it for, that kind of environment and why and hopefully give them that sort of understanding that comes with it. That's something that certainly, as I said, in our team we didn't have - I'll adapt to just about anything, so if there's only one of team who've ever used this kind of thing or I know can use this kind of thing and I know that from [GT7] that group project where we did use that successfully, or I believe we used it successfully.

We could have used it better but that was the first time we'd ever used it so you'll give us a bit of leeway.

Facilitator

So, how would you think it's going to be better?

PS

Sorry?

Facilitator

In what way do you think that you can be using it better?

PS

Just using it really. Just making it part of your workflow, making it this is where you go to get the latest information or updates or whatever it is even if the next meeting is at this time, even if that's like your home page and you go to that or something. It could be another thing.

Facilitator

In your team and your experience or you feel it's not there yet, it's not achieving to that level of use?

PS

That's what it should be. It should be a tool that you use and you say this is something that's sort of everywhere. It's front of mind rather than back of mind. It's not something like I need to log in and do all this stuff and then I can upload this document. It should be, I need to collaborate and to collaborate I need, for whatever reason, which should be really useful because it'll improve the quality of this or whatever, just having two sets of eyes on a document or whatever. You can just do all that kind of stuff.

Facilitator

So what hinders this level of use?

PS

Sorry?

Facilitator

What hinders people to get to that level of use?

PS

Part of it is the habit, that people weren't really in the habit. Even myself, I'd log in once a week to check it honestly. I check email daily but I'll log into once a week partly because I have to log in and partly because it's not my home page, partly because of the fact that people weren't making that part of their workflow as well. You can only do it so much until you kind of get sick of it because no one else is doing anything on it. It's like this is my space but where's the group part of my space? I definitely felt that at one stage of the project. Hopefully you understand that I've been contributing a fair bit to this but I haven't really seen anyone else even doing small things like fixing typos. I can see that someone actually read it and they cared enough about it to say I'm going to click edit and fixt the typo and click save. That's so easy to do but sometimes they weren't even really up to doing that because they only check it once a week and they're like maybe I'll just sort of fumble my way through it rather than actually reading it and seeing what this person was on about.

To bring it front of mind, those are the kinds of impedances, I think.

Facilitator

Is there anything that you think needs to be added to the wiki that may be able to help that transition from back of mind to front of mind?

PS

Some kind of image caption. I'm not sure if it does have something in there but certainly that kind of thing has never been discussed in lectures or tutorials or anything given by Debbie basically. That's the kind of thing that would actually turn it from, in my view, might be able to turn it from something which is back of mind - this is a way of managing documents - to this is a way of collaborating on documents. As I say, apart from the [unclear] which is basically purely text and most of the documents working include diagrams and diagrams means you need a way of capturing the diagram or uploading the diagram or whatever. If you have to save it as a separate document and then close out of that application and then upload it and then attach it to a ticket or something and then get someone else to download it and they've got to open it up again. It's too many steps for something which for a wiki-type thing you really just want an image on the page. That's the simplest way. That's what you boil it down to which is you need an easy way to say I want this image on the page and have that go up there and then anyone with a browser should be able to open it and see that image and it's not hard at all.

Facilitator

If it is not using that kind of wiki but using other wiki out there …

PS

Other wikis?

Facilitator

… would that be something that's useful to use as part of the collaboration in your web-based applications?

PS

Probably not because I think the concept of a wiki typically is that it's text and it's modifying an HTML page so that's basically text and whatever else you put into it. Unless the tools around it are really good, things like as I said, some way of capturing an image and putting it into a page and then uploading that so anyone can view that image. I don't know how useful that is.

Facilitator

That wiki actually captures an image of …

PS

I'm just discovering possible - I don't know if they'll ever implement something like this but I'm saying that would be something which I would find really useful especially if they gave us a tutorial on this is a way you could actually use this. I honestly haven't played with things like Google Wave or any of these other sorts of massive collaborative type services or Microsoft Sharepoint, for example. That's supposed to be another one of these sorts of things.

I should play with Google Docs to be honest. I haven't actually used that because Word just does everything.

Facilitator

Does PB Wikis or PB Works - it's like a free wiki. You can set up a group-based wiki and then you can play around with it.

PS

No I haven't.

Facilitator

You can upload photos, jpeg images.

PS

Upload is like one step better but it needs to be five steps better to make it that sort of collaboration-type thing. That's why I said if there's a utility of some kind - I don't know if it's possible to do this, but once you have Javascript running on a client's browser it should be possible, whether it's just to capture part of the client's screen which they specify. I don't think that should be too hard to do, to be honest, but maybe it is. Maybe that's why no one does it.

Facilitator

So for more web-based application containing this … screen …

PS

I'm saying just because then that seems to be the easiest way to actually get something like a diagram out and into a wiki. The alternative would be, could I have sufficiently smart JavaScript that if I copy an image out of - if I have an image in let's say Windows Explorer or something and I just want to drag and drop that image into the wiki, what's it going to do? It's probably going to copy the file name or something weird. Why can't it put the image itself in there? Other things like that, that some people might find a lot more intuitive. I'm just speculating here but it's essentially a way of saying I want to get an image or a video or anything else off there and I want to do it easily.

Another thing I haven't played with but I've heard a lot about is the ability to through a mobile phone be able to upload with a couple of button presses straight to YouTube. So that's another thing where that's really easy to do and it's not perfect obviously because it's like your home video type thing but it's easy and that's the important part. It's only a couple of clicks. It's not, I have to go through 27 steps and that's where it goes from having value to it's easier just to print it out and talk about it in a team meeting, so that's what we did. So I think that's the point, it's just the tool isn't there. If we wanted to use it collaboratively it's not worth our time to save an image out of a program and then upload it and then have someone else download it to view it. That's just too many steps.

Facilitator

That's good. Thank you for your input.

PS

You're welcome.

Interview AB

Facilitator

Well it basically was like to look at your experience when you were doing the course, especially on the use of web tools that support your online learning. Among those things could be Trac, could be the wiki components or any other components of the **Trac** or anything else that you add onto that. It could be using MSN messaging or emails or anything. So the interest is on how are the tools are being used to collaborate among your team members. So how many people was it in your – do you remember?

AB

For the project, we had four people in our group.

Facilitator

Four people, okay.

AB

Sorry, five people. Four people, first semester. Five people, second semester.

Facilitator

Yes. So this is throughout the whole year, only those continuing this.

AB

Yeah. We had different groups.

Facilitator

So how did the collaboration happen during – as far as the – when you were doing the project, among your own team, related to the first team or the second team? How as the collaboration and what form was the collaboration?

AB

Generally, it started out as emails, especially when you didn't know anyone. You'd send an email out saying hi to everyone. It wasn't until a lot later in the semester that you started using **Trac** a lot more. Personally, none of my groups used any MSN or anything. But yeah, email was a big thing. But it wasn't until sort of late first semester, into second semester, that we really realised the value of Trac, I think, especially like the wiki and the tickets, that kind of stuff. You didn't really know how to use.

Everyone just thought **Trac** was pretty crap. Only really useful for holding the files, I guess. But once we sort of got across that, I think it was very helpful. Like right now, when we're about to do the final presentation in a few days, **Trac** is sort of invaluable now. Because before you might have to send an email around, saying when's our next meeting, for example?

Because you would rely on then someone to send back oh I thought it was this day, some on this. You used to have all this massive amount of emails. Whereas now, at the end, whoever's the leader or transcribing or whatever can just put up next meeting, this date, on the wiki. So everyone can go there and people can put up they can't make it or whatever. Yeah. Just a lot easier and a lot easier sort of documenting stuff and having the revisions of the code. Yeah. I just found **Trac** was good now and that's probably our main use. Emails still get a bit, if you need it quick, you know, a quick response for something. But yeah, that's generally how it's gone.

Facilitator

So what was the features that, other than the two that you mentioned, that you previously didn't utilise in the use of **Trac** and suddenly now you're really starting to use it?

AB

Well, see that's the thing, is I think, even going back, I think we were supposed to use Trac, even in our second last year. Maybe that is a good time for someone to get a grounding for an hour say. Someone goes – a lecturer or a tutor or something goes through how to actually use it properly. Because you sort of don't really use it. You know what you can do, sort of. But until you actually do it and you have the projects especially where you need to make use of that kind of stuff, that you don't really use it.

So that might be something you can take for future people to just give them through – like I know Debbie went through, a bit, with the wiki and stuff this year, which was good. But until someone actually goes through and shows you how to do stuff on **Trac** and why it's relevant to you, I think people won't use it. Until we figure that out ourselves, yeah, we didn't really use **Trac** very much.

Facilitator

So how did you kind of figure out?

AB

Yes. Obviously started with using the wiki. That was obviously helpful, in terms of putting up information for everyone and you could create sort of web pages. Then it went towards when we had a list of things to do, we could have that on a Word document. But we started putting some tickets up and assigning tickets to people. Then we realised we could link that in with the wiki. So you could do that kind of thing, which was helpful if you needed to make comments, that kind of thing.

Also, yeah, I mean even the SVN. I mean, a proper ten minute introduction of how to use that properly. I mean, you knew how to probably get the code out, check it out and possibly update it back in. But things like, if you made a stuff-up reverting to an old version or that kind of thing, like we didn't know how to do. It was up to you to figure out. By knowing that, it sort of helped. Once you figured out, it helped going through and that kind of thing.

What else is in Trac? Yeah. I guess there's milestones as well. I mean, they're good for linking up when you have certain things due at certain parts. So you know what's left to do. I mean, in the real world, when you're doing a project, that kind of stuff is how you're going to do it. It's not too much hassle to sort of do it on **Trac** really. Yeah.

Facilitator

Sure. How did the wiki become useful in your collaboration?

AB

The wiki, at the start, the first semester, we didn't really use it at all. In the second semester, one guy just put up like names and phone numbers and emails and that was sort of a reference thing. We started using it more and putting up things like next meeting times, meeting notes, any ideas or suggestions and then you could even link them to the tickets and milestones and that. I think you could do the linking and that, which was helpful because, then rather than have to search through, you could just click on it and go straight through to see what they were sort of commenting on, which was helpful.

Yeah. I mean that would be the main thing. But you know, if you started off using it, there's a lot more things you could sort of brainstorm throughout, which we didn't really use so much, because we didn't sort of start using them until further in. But earlier on, it would have been a lot helpful, just to put up some ideas, especially like what you think the program's do, what you think how it should go, like even that kind of thing, basic stuff, down to notes of why you did what you did for certain parts. Like if you've just finished something, you could say how it worked and why all the changes, kind of thing.

Facilitator

So was it – how do you then see it now, the wiki part? Is it useful?

AB

Yeah. Oh valuable really. Yeah.

Facilitator

So the first thing that usually people use is just in uploading files.

AB

Yes. That would be the main thing is just people just upload files, not even using the SVN, the repository. They just upload it to the Trac.

Facilitator

That's a straightforward thing that you realised to use.

AB

Mm.

Facilitator

So what changes into having you realising all the other features? Did somebody start to use it or...?

AB

Yeah. It was just trial and error really. We saw it was there. I don't know. It was a bit strange. Because I remember, at the start, like last year and then the start of this year, just thinking **Trac** was really crap. Not – maybe it was more the fact I didn't appreciate what there was to offer. Yeah. It was just by going through it and looking at the different parts, different headings and sections, that – and playing with it around, pretty much, that's more what's happened later on the year. That we've played around and added things and sort of just, for fun almost, adding them and then realising that they were actually really useful.

Sort of when it's up there, sort of in writing, you can know. Because a lot of the time you would have had it set out in a Word document or an email. But when it's on there, it's a lot easier, to cross it off and that and add comments to each other. Yeah. I found it really useful. I mean, it's a lot easier than just sending a million emails back and forth.

A good example is when we were doing our last demonstration, we had to find something from one of our documents of something. It was everyone was searching through their inbox, trying to find it. If we just, from the start, had had it in the wiki, it would have been boom, we could have found it. Whereas it's dumb searching all the way through the inbox for an important part of an email. So yeah. I mean that was a sort of highlight of why.

Facilitator

So is your team, when you were collaborating on, working on parts of the project, do they work on a single part together or you break them apart? How do you...?

AB

It would be a mix of both. Like a lot of how it actually worked is we'd meet as a group, decide what needed to be done and then you'd either do part of it with your group there, depending on what it was, especially if it was something big, like a class diagram or something, for example.

But if it was something a bit – you know, one little part of a big thing, then you'd go and do it and then bring it back to the group the next week, sort of thing. So yeah, there wasn't a heap of sort of the documentation. But on the coding side, there definitely was. Like people would be working on the same parts of it at the same time, for sure.

Facilitator

So do you say you collaborate or work together when you physically meet?

AB

Yeah, we did. But I guess the majority of your work would be done by yourself. Obviously everyone has different schedules. But you'd meet up and you'd try to do what you could, like show what you'd done or what you were planning to do. If you needed help or even if you just needed to do something, yeah, a lot of the time you'd do part of something together at least, yeah.

Especially if it was something more tricky or a lot of people needed to have the input. If you're doing something and the whole group needs to decide how it's going to work, it's probably easiest when you meet, to show them this is what it does, what sort of do you want me to change it to. Or this is what I think.

Facilitator

So do you use the wiki pages to hold the content of the documents or anything?

AB

No. We didn't use them to hold content of documents, not really. We used them to hold information. But then that information would have been ripped out and put into a document. No, we did talk about that. But just with the structure of the actual end document and that was a lot different from how it was going to be on the wiki, if that makes sense.

Facilitator

How was it different?

AB

Just because obviously it's on a web page and we needed to have it in a report. So yeah, there was information on the wiki that you pulled out and put in the report and then had to reformat. But yeah. So I mean, yeah, it could have been better used in that kind of thing. But a lot of part of that documentation would have been written by one person, put into a document.

Then we would have gone through it, as a group, and made changes or talked about it, rather than being up on a wiki where we could have all looked through it, which would have been a better way, for sure. But yeah, like I said, as we didn't really develop the **Trac** skills until too late in the semester, that didn't really happen.

Facilitator

How long did it take 'til you finally start using more of the wiki or the Trac?

AB

Well first semester, we didn't really use it much at all. Sort of started to realise that it might have been useful near the end of the semester. But I mean, it was too late, by then, for most of our group. Then second semester, like I said, we didn't really start using it, only little on the wiki at the start. Then a few more weeks in, we started realising, once we started doing everything, how useful it was. I mean, just increase – probably sort of linear increase. Just general increase, increase, increase. Whereas now, we use it for most things. But yeah, it's a bit late for a lot of stuff.

Facilitator

So you went to the second half of semester – the year. You got – everybody's a new member in the group. Or have you got – you did have somebody...

AB

Yeah.

Facilitator

Everybody's new.

AB

All new members.

Facilitator

So were there anybody else? How was the other team? Do they actually contribute on the final using the wiki? Or do they have experience?

AB

I think most of us were in the same boat, that we hadn't used **Trac** much, didn't really use it much. It wasn't until – as we were all going along, that we realised. So one guy was pretty keen on it. He sort of started using it. Then because he used it, we sort of had to use it. Then we all realised more features and sort of thing. That's sort of how it developed. But yeah.

Facilitator

So what was the first use that...?

AB

The wiki. Oh, I guess uploading of files. Not to the repository, not to the SVN. Just uploading it to the **Trac** was probably the first use. Then the wiki would have followed after that.

Facilitator

Were you finding any difficulties when you started using more and more features in the wiki?

AB

It was a bit getting used to the sort of the coding of it, I guess. It was a bit different, because obviously it's – a lot of people might know the HTML sort of code. Then you had to learn this other one for essentially the same things. So yeah, that was a bit of getting used to. But once you're used to it, it's not too bad. But yeah, it's a bit strange at first, I guess.

Facilitator

Do you have any experience of using other similar software, like other wiki or other...?

AB

I hadn't before. I work – I just implemented a wiki. That's how much I rate them now. Yeah, I just started – bought up a wiki at work. Because they're just so valuable. Yeah. So no, not beforehand. But now, yeah, a little bit.

Facilitator

So do you find it useful now?

AB

Oh...

Facilitator

So you use it in your – the work?

AB

Yeah. It's immensely useful, just because, at my work, we have people in different states. So I mean, you can call them up. But if something happens in a hurry, they need to see something, or if I'm off or someone else is off work, if I'm at uni, then to find out the information, if you can just put it up, all the information about some program or something you do, then people can look at it and then they can figure out how to do it or fix the problem or whatever.

At work, we found that's heap useful, because obviously people in different states and you've got to support people in those other states, if they ring up and have a problem, if someone's off. Yeah. It just made it easy because there's a central place where you can go to look up the information. So yeah. Heaps useful.

Facilitator

So in this project, were you – obviously there's a lot of things happening in the wiki. Then as more – as time goes by, more and more things happening. How do you organise those things inside the wiki? Do you separate them into pages or something?

AB

Yes, separating into pages. That was one thing I thought **Trac** would do better is have a sort of – like a links bar on the side, like a sort of web page [unclear]. Just so that way you could have your sort of headings and you could click and then go through. So then it's more like a web page, I guess.

But yeah, we tried to separate into different documents. But I guess that is – I guess one of the challenges is that you have a lot of information. Once it goes somewhere, then you've got to try and move it around. So it did get a bit spaghetti, I guess. But yeah.

Facilitator

Is there anybody who was in charge of it? Or everybody just took...?

AB

Sort of our team leader was sort of in charge of it, I guess. But not really. Everyone just sort of did their own thing. Like I said, it was a bit late by the time we learnt a lot about the wiki too. Everyone didn't care too much about it. So it's a bit hectic.

Facilitator

Is that – obviously because the wiki, everybody started to contribute and everybody started organising things. Everybody can edit the same pages at the same time and everything. So would there be any adjustment on the team leader's side, the way how you work together? Because you do put on the protocols and thing and how to manage all this.

AB

No, we didn't. We didn't go as far as...

Facilitator

Complications and...

AB

Didn't go as far as that.

Facilitator

I mean, I guess, naturally...

AB

It was pretty relaxed.

Facilitator

No problem.

AB

Not really. Like I mean, we used it , but we didn't use it nearly as much as we could or should have. So yeah, we didn't really...

Facilitator

[Unclear]

AB

Pardon.

Facilitator

The propensity of users...

AB

Yeah.

Facilitator

Nobody edits the same pages or something.

AB

I don't think there was too much trouble with that, no.

Facilitator

So if you see from all this experience, what would be the most useful use, especially on the wiki part of Trac? Especially for kind of work you're doing, developing projects and everything.

AB

Just organising information, central sort of part, place that has that information that you need that anyone can change. That's probably the main part of it.

Facilitator

Is that compared to the things that you need to set up, you need to prepare? Is that worth it? Or is it too difficult to set up...?

AB

To set up the actual wiki.

Facilitator

Mm.

AB

Well I mean, it was set up by the computing department. So we didn't have to actually set up the whole wiki or anything. So it wasn't really – I mean, the main thing is learning how to use it. I mean if you know you've got to put the square brackets for the week and all that stuff, if you know how to do that, it's not really that hard. I mean, it even has the gooey part of it. So it's not that hard, once you know how. So no, I wouldn't really think it's – like I said, I reckon an hour's session on how to use **Trac** would cover it. Then people would see its value.

Facilitator

So like now you said you're also have experience on implementing a wiki type of apps in your own work group.

AB

Yes.

Facilitator

For work, was it?

AB

Yes.

Facilitator

So was it you that bring up this use of wiki for the group?

AB

Yes.

Facilitator

So how did you convince everybody else to, okay, let's use it?

AB

Well the uptake hasn't been huge, I must say.

Facilitator

How long has it been?

AB

Only probably two or three weeks.

Facilitator

Oh, okay.

AB

Because my direct boss was leaving. So we had to get a lot of the knowledge out of his head, I guess. Sort of a brain dump, if you will. I thought the best way was, obviously I'd been using these wikis at uni and I realised how good they were. I thought the best way would be to get him to enter stuff that he knew about certain projects into the wiki and that way, if anyone came up and said oh what's happening with this project or what's happening with this piece of software or there's a bug, then there'd be sort of a general repository where I can just go and look up where things were for that code or problems, that kind of general thing.

I mean, it's not – nowhere near finished. I put in some more things and some of the people in Darwin have put in a few things. But I mean, it's a busy time of the year. So I couldn't expect a lot of people to put in a lot of stuff yet. But I think it will definitely grow, just because, when you have people in different areas, you don't know 100 per cent of what they're doing and where stuff is. So yeah. Come back in a year from now and I think it'll be one of the critical parts of the IT department, at least anyway.

Facilitator

How do you foresee that? In one year, what kind of things were you expecting or would like to see happening in that wiki?

AB

Basically, we want – well I want – for a project, say you're writing a piece of software, you would have in where the location of the code is. So it might be checked into the source control where the stored procedures, like database stuff, is. Anything else, like if you need errors, common errors that might happen, how to fix them. Contacts, if you need any external contacts in other organisations. That kind of thing is all sort of your knowledge, that you know, because you did it. So if there's a problem, you can fix it, because you know all this, because you did it.

But if someone else in another state or somewhere in another office, they're trying to solve a problem for the thing that you did and you're not there to help them, then they don't know what to do. So this way, they can just go to the wiki and they can click on it and they can see, alright, the code's here, the thing – stuff's here. I can contact this person, blah-blah-blah. They know sort of what to do.

That makes it a heap easier because we have that exact problem a lot of the time, is that someone in one state will do one thing and then you might need to change it or fix it or something like that. You have no idea. So then you'll have to spend all this time trying to call them and you might not be able to get onto them. They might be really busy.

So yeah. In that sense, it just holds this information that is in someone's head. But then now it's available for everyone. Then if you go and make a change, you could add a note up there, saying I've changed it to this or I fixed this error by doing this. So everyone can keep adding more problems or solutions or whatever to it. That's where I see it going. I mean, you can understand where I'm coming from. That's immensely useful.

Obviously with the guy that was leaving, all his knowledge, we had to get out sort of straightaway, because we can't really be calling him up when he's now he's stopped working there. So we needed that, so that, if anyone of us has to fix the problem because he's not there anymore, we can just go to this page, see the information he's put in and then we'll know, hopefully, or be able to figure out how to fix this problem or update the thing or whatever. So that's where I see it going with work.

Yeah, the IT director was pretty supportive of it. He thought it was a good idea. The lead developer thought it was a great idea. He thought it was a really, really good idea. So yeah, I mean I would see it definitely picking up. I couldn't see it not picking up.

Facilitator

How many people altogether are going to be using the wiki?

AB

Probably six. There's only about six in the IT department. It's just an IT related one. So it would use about six people.

Facilitator

Hopefully get – pick up more.

AB

Yeah. Well, if there's more people we hire. But there's only six. So between all of us, just because if you're all in the one office, it's a bit different. But when you're in different offices, it makes it a lot harder to get all the knowledge in one place.

Facilitator

So geographically, it's separate as well.

AB

Yes. So yeah, that's the reason behind it. Yeah.

Facilitator

Well okay then. That's pretty much it. Thank you very much.

AB

No worries.

Facilitator

Later, we'll publish…

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15 Appendix G: Case 2 Data

The following are tabulated questionnaire data and interview collected for Case 2. The list of the questionnaire questions can be seen in Appendix A: Research Instruments.

Questionnaire response

Table 27. Case study 2 Questionnaire Response 1

Respondent:	SD	CD	LZ	MN
Qn 1	Disagree	Agree	Agree	
Qn 2	Agree	Neither agree nor disagree	Strongly Agree	
Qn 3	Agree	Agree	Agree	
Qn 4	Disagree	Agree	Agree	
Qn 5	Disagree	Neither agree nor disagree	Neither agree nor disagree	
Qn 6	Disagree	Agree	Neither agree nor disagree	
Qn 7	Agree	Agree	Neither agree nor disagree	
Qn 8	Disagree	Agree	Agree	
Qn 9	Disagree	Agree	Agree	
Qn 10	Agree	Neither agree nor disagree	Neither agree nor disagree	
Qn 11	Disagree	Disagree	Neither agree nor disagree	
Qn 12	Disagree	Disagree	Neither agree nor disagree	
Qn 13	Agree	Neither agree nor disagree	Neither agree nor disagree	
Qn 14		discussion board	Difficult - wiki	
Qn 15		planned on paper then uploaded onto computer.	.	
Qn 16		select an area to focus on then come together to share and exchange ideas.	Discussion	

Qn 17	selected a part we were interested in then exchanged work to look at and provide feedback on each others work as well as contribute new ideas to.	Discussion
Qn 18	communicated effectively	Ok
Qn 19	great to use a whole group tool.	I haven't used it much. It is useful to read other students notes.
Qn 20	n/a	.
Qn 21	first time user and found it interesting	.
Qn 22	no objections both on the same level	Just discussion
Qn 23	stay positive	No.
Qn 24	learning purposes only	.

Table 28. Case study 2 Questionnaire Response 2

Respondent:	**BR**	**MC**	**CP**	**KH**
Qn 1	Neither agree nor disagree	Neither agree nor disagree	Agree	Agree
Qn 2	Disagree	Neither agree nor disagree	Agree	Disagree
Qn 3	Agree	Agree	Strongly Agree	Agree
Qn 4	Agree	Agree	Agree	Agree
Qn 5	Disagree	Neither agree nor disagree	Neither agree nor disagree	Disagree
Qn 6	Agree	Agree	Neither agree nor disagree	Neither agree nor disagree
Qn 7	Agree	Neither agree nor disagree	Agree	Neither agree nor disagree
Qn 8	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Disagree
Qn 9	Agree	Agree	Neither agree nor disagree	Disagree
Qn 10	Disagree	Agree	Agree	Neither agree nor disagree
Qn 11	Neither agree nor disagree	Neither agree nor disagree	Disagree	Agree
Qn 12	Agree	Neither agree nor disagree	Disagree	Disagree
Qn 13	Disagree	Neither agree nor disagree	Disagree	Neither agree nor disagree

Qn 14	wiki	wiki	Wiki - good for quickly sharinf info. Difficult when tech problems (like logging in, etc)
Qn 15	face to face, easy to collaborate	email	websites - to provide examples of what we were discussing.
Qn 16	Worked well on all tasks	not yet work on a group task	discussion, one person typing our ideas.
Qn 17	Talked and took it in turns	n/a	whoever was sitting at the computer that we gathered around usually ended up typing. we all contributed to discussion.
Qn 18	Very good, no problems	n/a	successful, productive, fun.
Qn 19	Was ok, did not have much experience with it but was a good way to collaborate ideas and things we have learnt.	communicating and sharing information	i see it (wiki) as a valuable way to share information with lots of people quickly. also overcomes any geographical issues with communication.
Qn 20	Sharing in terms of giving ideas to each other and asking questions that we may not know but they might. Was a good way to read others ideas of people i would not normally talk to.	n/a	accumulation of ideas (greater source). wiki helps by multiplying the number of ideas you have access to.
Qn 21	I have not used the wiki since as i found it a little bit hard to navigate around and use, and didnt have much experience with it before we stopped using it.	effective	i can definitely appreciate the benefits of their use. helps collaboration by giving people greater access to each others'information.
Qn 22	We only used face to face and the wiki, i preffered face to face, but got information from others i did not talk to face to face to.	n/a	no

Qn 23	I dont believe my communication style changed no.	n/a	i dont feel that i made any overall adjustments to my attitude towards group work.	
Qn 24	We only used the wiki and that was for learning purposes only.	Educational and personal. wiki appropriate for uni work	wiki - learning purposes, to share info. Definitely appropriate.	

Table 29. Case study 2 Questionnaire Response 3

Respondent:	**CW**	**JK**	**MS**	**AM**
Qn 1	Neither agree nor disagree	Neither agree nor disagree	Agree	Agree
Qn 2	Agree	Agree	Disagree	Neither agree nor disagree
Qn 3	Strongly Agree	Strongly Agree	Agree	Strongly Agree
Qn 4	Agree	Strongly Agree	Agree	Agree
Qn 5	Neither agree nor disagree	Neither agree nor disagree	Disagree	Agree
Qn 6	Agree	Disagree	Agree	Agree
Qn 7	Disagree	Strongly Agree	Agree	Neither agree nor disagree
Qn 8	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree
Qn 9	Agree	Disagree	Neither agree nor disagree	Agree
Qn 10	Disagree	Strongly Disagree	Agree	Agree
Qn 11	N/A (do not use wiki)	Strongly Disagree	Agree	Neither agree nor disagree
Qn 12	Disagree	Strongly Disagree	Disagree	Agree
Qn 13	Neither agree nor disagree	Strongly Agree	Agree	Neither agree nor disagree
Qn 14	Wiki page good for social networking and sharing ideas - peer colabaration. Not very easy to navigate round the pages. Need to learn more about how to edit pages.		Wiki Page. I found it easy to share information and add all our work. It was hard to set up and took alot of time instead of being able to do quality work.	I used the wiki to share information and read others contributions.
Qn 15	Websites i.e. links to other pages & email.		We used web resources that we have used previously and these were used to show the people we were working with what we could do in a classroom. These provide excellent resources for us to all use.	I don't think our group explored using many other additional tools.

Qn 16	We started off quite well.	We worked in groups on the wiki to provide resources that we all used and have seen to put on the Wiki page so that all students had access to different resources.	Verbally discussed topic then summarised main points onto public wiki page.
Qn 17	Free for all.	The group divided their tasks evenly and students worked together to make an easy and understood way to provide us with the responisibilty to give information to each other.	Volunteered for different roles.
Qn 18	Not very consistent	We worked well together providing information for all students to use. We provided information to each other and had good ideas. We used the tools very well.	An easygoing and cooperative environment.
Qn 19	It's great to suppliment our work.	It is a good tool to use as information that can be provided to all students. It is a good sharing tool. The wiki provides us with the opportunity to collaberate effectively. Effective means that we can share things and everyone has access.	I believe it is a valuable tool in being able to share and exchange information.
Qn 20	?	Being able to provide each other information and having an equal share of doing the work. The wiki was able to share the information we had and give us a great chance to work with each other.	I would seek an exchange of useful information such as sharing relevant sites.

Qn 21	40734	It was a good back up for what we were learning providing us with the opportunity to provide us with the information that we need to work together.	I feel the tools are an effective method for sharing information.
Qn 22	E-mail	We all used this as a way to communicate as well as providing discussion groups and working together on the things we were learning.	I don't feel any member of the group had a particular preference for any one method.
Qn 23	No	No it was only used as an extra tool to provide information to us all.	I don't feel my communication style changed as a result from working with these tools.
Qn 24	Yes, good for both.	The wiki and the websites have been used for learning process and they are appropriate to use in the teaching field as valuable resources.	I have used email and public pages for both social and learning purposes. I feel that both can be appropriate for certain sharing purposes.

Table 30. Case study 2 Questionnaire Response 4

Respondent:	**SW**
Qn 1	Agree
Qn 2	Disagree
Qn 3	Strongly Agree
Qn 4	Agree
Qn 5	Agree
Qn 6	Agree
Qn 7	Neither agree nor disagree
Qn 8	Agree
Qn 9	Agree
Qn 10	Neither agree nor disagree
Qn 11	Disagree

Qn 12	Disagree
Qn 13	Agree
Qn 14	Direct email and conversations with peers. Easy because you can target enquiries directly to people you know.
Qn 15	Only used wiki within TEP tutorial groups.
Qn 16	We didn't.
Qn 17	N/A
Qn 18	N/A
Qn 19	With practice, it would be a good process of collaboration.
Qn 20	It is great to share IT resources. Can take too long to find them all yourself.
Qn 21	With practice I will learn to value them more.
Qn 22	Not really.
Qn 23	No.
Qn 24	Email for both. Wiki for learning only.

Interview transcript

Interview BR & AM

Facilitator

Did you do collaboration during the - are you in pairs?

BR

We were in a group of three...

AM

Yeah, a group of three.

BR

...and we were in the same group.

Facilitator

In the same group?

BR

With another girl, yep.

Facilitator

Okay. So you are...

AM

BR and AM.

Facilitator

BR and AM. Okay. So did you do a collaboration in, when you were doing the assignment? What form was the collaboration took place?

BR

It wasn't an assignment.

AM

No, it was more of - just current work that we'd be adding onto on a weekly basis.

BR

It was tools for teaching. So it was what we'd done in our pracs, and how - and we could share that with everyone else. So it wasn't for an assignment, it was just in a class to help everyone.

AM

So in that class situation, the three of us would discuss whatever questions or whatever theme that week was on, and then one of us would just sit there and write it up and add that to the wiki.

Facilitator

So during the collaboration you were in class together?

BR

Yep.

AM

Yep. Always face to face.

Facilitator With the person, it was face to face.

BR

Yep.

Facilitator

Oh, so was there any managing workload among you?

AM

I think we just took turns.

BR

Yeah. It was only a few weeks that we did it.

AM

So, yeah, I think we just took turns, week by week.

BR

Yep.

Facilitator

How long was the duration of the assignment?

BR

It wasn’t an assignment, and it was just six weeks, or something.

Facilitator

Six weeks.

BR

Out of a 13 week semester...

AM

Yeah.

BR

...by the time we got into this room where we had the computers, and by the time we got it all set up and got our accounts done, there was only maybe four to six weeks that we actually did the wiki.

Facilitator

During the duration you made every week?

BR

Yep.

AM

Yes.

Facilitator

So during the class [inaudible].

BR

Yep. Same time now, this is the same class, but last semester.

Facilitator

Okay.

BR

Was it last semester or last year? Whatever.

Facilitator

So if you were together, working, obviously there would be parts that are jointly composed?

AM

Yeah, well we would discuss it verbally between the three of us, and it had all of our names under that heading. We would then jointly respond to something.

Facilitator

Would there be any follow up afterwards?

AM

There was opportunity to follow up, but...

BR

We didn't.

AM

probably didn't use it at that point.

BR

Busy.

Facilitator

So would you use it to share anything, amongst your team members, other than working at the same place together?

BR

No. Outside of class?

Facilitator

Outside of class.

BR

No, we didn't use it. This one we might, the one - the wiki we're doing now in this class. We're doing tips for the grades that we're doing in class at the moment. So if I can get into that I actually, probably, would go and - if I've got a year six class I'll go to the year six one and get an idea, but with the other one that we did the questionnaire on, probably not. I don't even remember the website. If I did I might. That was tools for classroom management, so if I found it, I might, but I don't even remember the website.

AM

I have the website.

BR

Oh, well there you go. We could look it up again.

Facilitator: In this interview, you can also track the information out from the current one, if you are using at [inaudible].

BR

Oh, yeah, that's the one we're doing at the moment and that's good, yeah. It's the same kind of thing...

AM

Yeah.

BR

...exactly what we did before, but we're just doing it on a different topic.

AM

This is - I don't think it's probably as collaborative. I think it could be more an individual...

BR

Yeah.

AM

...tool for this time around, because you write - you can really separate the work and separate the ideas, and have your own name attached to it. If you wanted to then look at other people's ideas, you go into it in that sense of collaboration, but it's - I think it's not so much of a joint response.

BR

We do do it in groups. I'm in a group of three and we've talked about our ideas. Then again, they just go on my page under my name, and we've just put all our ideas - but again, they're all separate.

Facilitator

Separate.

BR

So they've thought of one idea and we've written that, then I've thought of an idea and we've written that.

Facilitator

On the same page?

BR

Yeah, but it's got their names under it and so it's - but yeah, we could do it by ourselves if we wanted to.

Facilitator

So other than your own experience looking at the whole use of this tool, what kind of things did the tool support you to do?

BR

Pardon?

Facilitator

What benefit of using the wiki?

AM

Just being able to have that access to information which you know is going to be relevant. For example, the current wiki which is based around the theme of casual teaching, which is going to be relevant to all of us as we finish our degrees, I think that's useful. As BR mentioned, you can go to a place and get ideas from other people, so it's just that sharing tool.

BR

That's the collaboration, that after this we can look at their work and see what they've done and thought, that's a good idea, and then we can use it after uni's finished.

AM

So I think that this particular wiki's very beneficial.

BR

Yeah.

Facilitator

Content wise?

BR

Yeah.

Facilitator

During the process of doing this...

BR

Yep.

Facilitator

...collaborating...

BR

Yep.

Facilitator

...what kind of - would you be able to do that with other wiki?

AM

Yeah, I've been a part of a few other wikis for different reasons. I think they really need to serve a purpose, which I think this one does do...

BR

Yep.

AM

...so in that case, it's...

BR

Yeah. I don't think you could do it to such an extent, because there's so many of us. I could talk to maybe five of my friends and get their ideas, but they might not have done the year that I'm doing, or whatever, and I might forget, or I might lose a notebook, but this is online. I can go there whenever. I can go there when I'm at the school and look up - oh, I don't know what to do, I'll look up there and go quickly. So I think it's - yeah, it's a good way of doing it. We do - when we say we could do it individually, I've found it's good to be with who I'm with, because you bounce ideas off them. Have you ever done this? Then they say, oh yeah, and we make it even better, the activity. So there are some that you can do, and it helps to - oh, do you remember doing that? They say, yeah, so then we write it down.

Facilitator

During the process, why didn't you use it outside of class? Because of the time restrictions is it?

BR

The last one?

Facilitator

Yeah.

BR

The one from last year I just didn't - I think at that point we didn't do - maybe the year I was in. I don't know. Why didn't we use it? Maybe the classroom management, because they were all our ideas and we all did a different question, I think it was. Maybe that's why. Yeah. I think it was a set of five questions, and we did one question and they did another question. So when I got home, I'd already learned about my classroom management. I didn't go to their question. I don't know, I just didn't, I don't know.

AM

I didn't find the information as relevant...

BR

Yeah.

AM

...I think.

Facilitator

Oh, okay.

BR

Whereas this time I actually want to use all this stuff. So I guess it was content rather than the service.

Facilitator

So this time you actually more...

BR

Yep.

Facilitator

...collaborated.

BR

Yeah, and I guess now, because we know how to use it. Whereas last time we were just here going, okay, we'll put that in, go home. Whereas now we know the process from last time and now we know.

Facilitator

So last time was the first time you used the wiki?

BR

Yep. For me.

AM

Not for me.

Facilitator

So when was the first time you used the wiki?

AM

When I was on one of my pracs, the classroom that I was working with was very involved in creating their class wiki and they'd submit homework through it. I had to become involved for my own teaching and learning purposes, so I was submitting pages of riddles, and they'd have their own personal pages. It just became a tool there, so I became familiar with it in that process of the class - as in a primary school class - collaboration effort. It was good. It was good in that sense, as well.

Facilitator

What experience did you have before, that you used in this time when you were using the wiki?

AM

To be honest, I was just familiar with it. I wouldn't say that I brought any new skills or anything to the process. I had to get familiar with it very quickly on prac. I didn't really have time to learn the ropes. It was just a matter of teaching myself within a few minutes. Yeah, it definitely helps when you're familiar with the way something works.

Facilitator

Was it the same wiki or different wiki? Different platform?

AM

Well, it's all - I'm confused - I'm a member of three or four different wikis, but they're all under the umbrella of PBWORKS.

Facilitator

PBWORKS, oh PBWORKS.

AM

Yep.

Facilitator

With yourself, from the first time you used it, and now this second round that you're using it, what do you think that you would try to use it this time?

BR

I'm still confused. I still had to get help setting it up, but now it's setup, it's easy to go, edit, and type. To set it up, I'm still confused. Hence, probably, why I'm more likely less to use it last time, because I've gone home and went, I don't even know how to get onto it. So I just didn't. Whereas now I get here and I can get onto it, at least, so I guess that's changed why I understand...

Facilitator

Was there any lessons learned from the last time you used it?

BR

Yeah, yeah. So I'm getting there, but I'm not quite - still not competent to use it by myself yet, I don't think.

Facilitator

So what was the lesson learned from the first time you used it? Now you're not going to use it that way again, or design [inaudible].

BR

No, now I know how to get in and edit. Last time I had these two and they were telling me how to do it, so I was just following them. Now, at least, I can get into it by myself and edit and add stuff to it. I still wouldn't know how to add a page, or anything. Whoops. They probably play around with it, but I just haven't had time.

Facilitator

So during the collaboration, would the team work on a single page in wiki, or you create multiple page yourself?

BR

Last time was multiple, this time was one. Yeah. Last time, each week we did a different page, with a new question.

Facilitator

Oh.

BR

Yeah.

Facilitator

Why is it different now?

BR

We're just doing one activity. We're just saying, get ideas from the class you're on, and say what you would do in that class. So it's all…

Facilitator

Just keep adding…

BR

…kindergarten.

AM

Yeah, we're just adding on the same page.

Facilitator

Just adding on the same page.

BR

Yeah, whereas last time each week was a new question, and we'd put a new question on a new page. So that's - yeah, different new pages.

Facilitator

Were there any edits? I mean, when somebody added something...

BR

Yep.

Facilitator

... somebody else would alter information?

BR

Yep.

Facilitator

Or...

BR

Yep.

Facilitator

...are they adding new things? Or...

AM

No, there was edit as well...

Facilitator

...were you changing yourself? Yes, as well.

AM

...and comments...

BR

Yep.

AM

...regarding - a few members of the class, you could see, had commented on other people's ideas, and things like that.

Facilitator

Okay. One last question is, so individually, if you were to tell others on how to use, or how this tool, wiki in particular, is appropriate to use for other people who have never used wiki before, what would you tell them? This technology or tool is good for what, or not good for what?

AM

I thought it's useful at the moment. I thought it was useful in that classroom environment. So I'd say for - say, you know, we're studying primary education. For a year six class, I think it's a useful tool in being able to share ideas and develop their ICT skills and to do those - that medium. I also think it's useful for someone that wanted to just share information on a relevant - on the same umbrella theme of what we're doing at the moment; teaching ideas for casual work. I think that's a useful tool. Then having different students that I wouldn't usually speak to on campus being able to then put through their ideas, and then I can locate that at home in my own time...

BR

Yep.

AM

...to look at. I think that's...

BR

Yeah, it's always there.

AM

...really useful.

BR

Yep.

AM

So I’d say, for sharing information.

Facilitator

Sharing information.

BR

Yeah, because it’s always there, on the net. You don’t have to - you won’t lose anything.

AM

Yeah, you won’t lose that piece of paper.

BR

It’s always going to be on that, and you can always add to it, and people can add to it. If they say, oh, I don’t understand - like, if I’ve put up an activity of how to do, make a koala or something, and they’ll say, I don’t understand how you did that, they could contact me and say, how did you do it? Then I could contact back. So it’s - yeah, it’s just always collaboration. If they need to, they can contact me and I can comment back.

Facilitator

Would it be more appropriate for individually they work on something and then share, or they work together on a single...?

AM

I think it depends on the purpose.

BR

Yeah.

Facilitator

How would be the difficulty or benefit of each?

BR

It would be difficult to do it separately unless you sent it in an email and then tried to - do you mean two separate pages?

Facilitator

Yeah, like when the first time you used it...

BR

Yeah.

Facilitator

...you make - you're working on separate pages , but that's...

BR

Yeah.

Facilitator

...obviously it's - because of you had the separate assignments, was it? The separate parts of it?

BR

Yeah.

Facilitator

But on the second one you actually all work on the same page. Would it be more difficult to edit the same page, or would you...

BR

I think it would be more difficult to have separate pages.

Facilitator

Oh, generally more difficult.

BR

Yeah, I think.

AM

The whole class isn't on the same page, still. Once we create a page, and we're adding to that page over the course of this one, but my page has my name and another girl's name. It's still - that's not the same page for the rest of the class, though.

BR

Yeah, it's just those two.

AM

So it's single pages in regards to that group, not as in the whole class.

Facilitator

You're saying one group, the two of you, share a page?

BR

Only one page, yep.

AM

Yes.

Facilitator

And you are working and editing on the same page?

AM

Yes.

BR

Yep.

AM

Yes.

Facilitator: Would that be an easier way of - would that be more useful, or maybe just...

BR

Well, I think it's hard, because only I can get in, can't I? Because it's in my name.

AM

I haven't had that problem as of yet...

BR

Oh, okay.

AM

...I know whether they have that on the main page, when it's editing. Obviously you can't still the lock off things, but...

BR

I still don't know the...

AM: ...but...

BR

...the way it works.

AM

I don't really have an opinion. I don't know. I think it's...

BR

I think if you're talking about the same topic and you want - you need to create something together, two of you on one page, to have two separate pages would obviously be harder to...

AM

Yeah.

BR

...to collaborate into one.

AM

You don't want multiple pages of the same information...

BR

Yep.

AM

...because it just becomes over - you know.

BR

Yeah.

Facilitator

But does the self-lesson make it too difficult to collaborate any other way?

AM

I think it just depends on competence, I mean, if people are familiar with it or not. If they're not familiar with it, I don't see how that would work, but if they were familiar with it, then I don't see a problem with that.

Facilitator

Do you think there's any weaknesses? Or things that are not working in the wiki? Or do you think, you think - I don't know, this should be doing this way?

BR

I've done very basic stuff, so no. There's nothing that's not working, because I've done edit, and put writing, and change the colour. So, no, and I think we've linked stuff to it and people have done that. I haven't. Like an HTML link, or something - they've done some form of link, and they've done it, but not me. No, not from what I've used.

AM

Yeah, I can't think of anything.

Facilitator

Is there something that you think, the wiki should be able to do this and that, but you think it couldn't?

AM

I think it's a - I don't know. I mean, it perhaps could be a little bit more user friendly, I think.

BR

Yeah, I'm confused...

Facilitator

User friendly.

BR

... and I'm usually pretty good with technology and I get in there and go, I don't know where to start.

AM

Yeah, I mean, I don't - I think there could be a more - a simplified and more obvious version of a help - quick rundown, of how to use the wiki things and available to people. Just things like adding those web links and pictures of things, I think could be probably a little bit easier. In saying that, I don't really have anything.

BR

I went to add a picture today; I couldn't see how to add a picture. Is that - would that have to be from the net? You know, just a simple picture? You couldn't do that? I don't know if you need to do that, but I was going to do it today, and I couldn't. I mean I haven't looked, yet, properly, because I only had five minutes, but - things like that. There wasn't just a thing that said, insert picture. You know, that's like Word. I don't know if you actually want to do that in PBWORKS, but I did, so maybe that could be added. I don't know. I don't know other purposes other people use it for. Yeah.

Facilitator

Okay then, that's something. We've got enough.

Interview CP & KI

Facilitator

Okay. Thank you for coming. Here is Claire and [KI].

CP

I'm CP.

Facilitator

Sorry.

CP

I just realised. Sorry, I thought you said my name first.

Facilitator

CP?

CP

Number 9. No, I'm not number 9. What number am I? Seven, sorry.

Facilitator

Sorry. Sorry. No worries.

CP

No worries. We got there eventually.

Facilitator

It's a mix up, yeah, but it's okay. So the interview is about looking at your experience in using the wiki either from the last semester or here - or now because it was a bit different the way things are - were - some of us were - the task was given then and now.

CP

Okay.

Facilitator

So you can reflect your earlier experience of those things. So the first was - there's only two questions actually but [unclear] so how did you collaborate and what form of collaboration did it took place?

CP

Well, last semester we did - we talked about - we worked in stage groups so people on similar classes and - what was the question? It was like...

KI

She had a range of questions and every week we did a different topic. So it might have been morning routines...

CP

Yeah, or like discipline, rewards. So we would pretty much just work with somebody who was on a similar stage and talk about what we'd learned through our prac and then we wrote it up like in point form and so everybody could look at the different stages and...

KI

The different kinds of things that teachers do.

CP

Yeah.

Facilitator

Were you in the same group?

KI

We were in the same stage but we were in a different group. Yeah. I think Kathy had a couple of groups for each stage. So, yeah, but the two - we actually talked about it because I remember all of the kindergarten people...

CP

Yeah, well it's hard because people were away and people moving around. So like it was hard to have separate groups when people - we were working with different people every week sometimes.

Facilitator

So there was a lot of discussion between the groups in the same stage?

CP

Yeah.

KI

Yeah. Yeah, definitely.

CP

The thing I didn't like about it was we did - we never - we never discussed it. Like we were kind of expected to just read through everybody else's in our own time.

KI

Yeah.

CP

Like there was no time that we stood up - you know everybody stood up and read their information out and talked about it or anything.

KI

Or if there was it was only like one group or something like...

CP

Yeah, I didn't even...

KI

You don't remember?

CP

Yeah, it wasn't used - like you discuss with the people in your group but then the information wasn't utilised again in a discussion kind of format.

Facilitator

So how the - how the whole process was happening?

CP

Well, we - just when we came into class we would just sit down and keep going with it.

KI

Login and - yeah, basically the new question was up and you put that question in your page and put your link to it and, yeah.

Facilitator

How was it in between groups happen?

KI

Well, between groups - there was a lot of discussion within groups and between groups I would say it was pretty much up to you to look at what other people had done, do you think?

CP

Yeah. Yeah.

KI

So communication between groups was all about reading what other groups had written pretty much.

CP

Yeah, there was no discussion between them.

Facilitator

Did it happen in the class or outside the class?

KI

You were meant to do it outside. Yeah, because by the time you wrote your own group's thing the class time was pretty much up.

Facilitator

Yes. The discussion within group was in class or outside class?

CP

In class. So within our group [unclear].

Facilitator

There was no discussion outside the classroom?

CP

The whole - no, I didn't really do any with my group, did you?

KI

No. No.

CP

It was all in just that hour, yeah.

Facilitator

In that hour did you have a chance to look at other groups - other groups work?

CP

I've actually had a bit of problems with my login. Just I've had - I've had a few attempts and like everyone has tried to fix it and stuff. I've had problems so I honestly haven't really used it because I've found it hard to get in but I don't know if you...

KI

No, I've never even looked at it outside.

Facilitator

Outside the classroom?

CP

Yeah. I mean, it's helpful to look at in class when somebody else was logged in but I haven't tried on my own because of my problems with getting in. Yeah.

Facilitator

So how is it - how is the workload managed in collaboration within your group?

CP

I think it was very - if your group were like mine, it was pretty much let's have a 10 minute discussion and then one person would type the main points and it wasn't...

Facilitator

[Unclear]?

CP

Yeah. No one was looking at it like, I'm doing more work than you because really typing it wasn't that much of an effort. So, yeah, it was all pretty even, just everyone contributed to the discussion and then you summarised the discussion to put on the wiki

Facilitator

So was there any sharing of resources or files of work in between your group members.

CP

Yeah, definitely sharing resources. Like - because we were at a computer it was really easy to go to all the websites that we found helpful. So we used to just go, I saw this one and type it in and everyone would go, that's really cool, so then we'd link it and just things like that. So it was easy to share resources that way and also with sharing just ideas. Like I saw this happen, I saw this happen, if you go to this book. You know that sort of thing. It was - we talked a lot about that kind of stuff and then most of that got put on [unclear].

KI

That was really the best part about it...

CP

Definitely.

KI

...was the sharing of the resources because like especially with websites and stuff there's so many websites and it takes you hours to trawl through them so if one person just trawls through them and then says, I found this, this and this then it saves everybody else all that time.

CP

Or even ones that you've been given by your teacher, which was the case with me.

KI

Yeah, ones that work and things like that.

CP

Yeah.

Facilitator

So in regard to that or in any part of the collaboration was the technology useful?

KI

Absolutely.

CP

Definitely.

Facilitator

In what way is it useful?

KI

In the sense of being really, really easy to show someone and then as soon as you've shown them and they like it it's then really easy to just link it and then however many people want it have got it instantly. Like you don't have to go then find the book or find the sheet or whatever, it's just there.

KI

Yeah, or piece of paper. Yeah.

CP

Also you know with - as much as book resources and sheet resources are awesome you have to photocopy it or you have to buy it or you have to like loan it, you can't just - if you have a computer, the ones on your - the technology of the computers is really easy. Yeah.

Facilitator

So for you what would be the value of the tools itself? Does it help you [unclear]?

KI

I think the best bit about it was the resource. So it was valuable for that, for sharing resources and the one that we did with the lesson ideas. We did one that we wrote out some science experiments that we'd done with our classes, which we'd done for a previous assignment. So that was really valuable because it gave you some lesson ideas with things that other people had already tried.

CP

The best thing for me was it's such a condensed - and provided your login works easily accessible, like instead of - you know like you said trawling through countless amounts of resource and whatever, if you have half an hour where you can flick through everyone's page and see everything that they've written and summarised it's just so easy. Like you get such a scope in relatively short amount of time. So that's the biggest power to it, I think for me.

Facilitator

So how do you organise those things when people start collecting things? Do you organise them in such a way or...

KI

Kathy's had us organising in stages and also topics. So our first one was things for kindergarten, for example, or things for stage 2 and if you're teaching stage 2 then you just click on that and it's all there. This one is you give it topics, so maybe games for whatever stage and then if you're looking for a game well obviously you go to that or just general tips, whatever. That's how I see it's organised. Yeah.

CP

Yeah.

Facilitator

They had their own customised, personalised way of organising things or just follow the...

KI

People tend to stick to the way - I think that people understand that for it to be easy to follow you have to follow the way that everyone is doing it. So I haven't noticed that anyone's gone off on their own tangent. Everyone pretty much sticks to the way that Kathy lays it out. I keep saying Kathy because she's the only one that I've done a weekly with so I don't know.

Facilitator

If you are to say - tell a person that's just new in - when was - is this the first time you used the wiki?

CP

This year.

KI

Last year as well.

CP

Yeah, last year. Yeah.

Facilitator

So was it difficult?

KI

It takes a bit of getting your head around, especially if you're not very technologically savvy. Like even creating a new page and linking things, it takes a little while to get your head around it and even then - like even when we did a new one last week Kathy was standing behind me and she was like, click on this, click on this and I was like, oh and I've already done it three times but I was just like, what, where do I click? Like it's not - it's not really easily set out or anything...

CP

Yeah.

KI

...but in terms of accessing the information, provided you can login, once it's all set up it's very easy to find the information. I think maybe just in the way that we've set it out but it's - yeah, easy to access the information. Not real easy to set up and create the pages and things like that but, yeah.

CP

I think that if you've used lots of other websites some of it is just intuitive. It becomes intuitive. So a lot of it you would find easy provided you've had that background but to someone who had never used a computer I would prepare them that it would be really difficult and the most difficult thing I found is problems with login but I assume once you get passed that - that's probably the biggest problem I've had with it.

KI

People - yeah, people are still having problems with that and they've been using it for two years.

Facilitator

There may be people having a problem with login?

KI

Yeah.

CP

I don't know, I have the whole time.

KI

Yeah, she said just before, who still can't login and there was a few people put their hand up.

CP

Yeah, that's right.

KI

We've been using it for two years.

CP

Yeah. Yeah.

KI

Like yourself included. Like it's just hard.

CP

It is - like I've found once somebody else has logged in it's fine to use. Like if one of my group members has logged in I'm happy to use it but I've always found it a problem to log in and I don't know why. Like we've tried to sort it out, I don't know why but, yeah.

CP

Apart from that that's the only thing I've really had issues with it. Apart from that it's all right.

Facilitator

So if you had to tell a colleague that is new [unclear] and never used it before, what kind of things would you tell to him or her on how - what's appropriate, this [unclear] or what's the difficulty of the system or...

CP

The actual like purpose of it or in creating one?

Facilitator

When that person want to use the wiki for the first time for collaborating?

KI

I would say you would use it for sharing resources and lesson plans and things like that.

CP

Yeah, a great sharing tool.

KI

Yeah, but the disadvantage would be like the initial setting up and getting a login and things like that.

CP

Yeah, they would need help.

KI

Yeah, that's - if somebody had never used it before they would just - it would be very difficult. Not like Google or like Hotmail or something where everything's really straightforward and set out. Using a wiki it's hard because you have to know the difference between edit mode and view mode. Like if you're in view mode and you're trying - like you don't understand why you can't type, I mean it seems basic if you use other things like that but if you've never touched a website like that well you'd be sitting there just completely baffled and it would seem useless.

So just things like that, like be aware of the different modes and like linking - like if you don't know how to link it's kind of useless because it all relies on you being able to get to other things. So those - yeah, those kind of things I'd really either, you know, tell them they have to read up on or tell them they have to get help on before they try because I would imagine it would be pretty frustrating to attempt it and not know how to do that kind of stuff.

Facilitator

So in your pages there will be many links, is it?

KI

We use lots of links, yeah.

Facilitator

Your links - you put in the links yourself or you link outside wiki as well?

KI

Well, mostly outside, isn't it/

CP

Mostly outside. You have links in the wiki - like you can go to...

KI

Oh, yeah. Yeah.

CP

...this group and show what they've done but in - once you go to them and you show what they've done they probably have like any number of links to outside websites and - yeah.

Facilitator

So when you're doing your collaborations was it single page that you do or did you have multiple pages?

CP

This one has turned out to be a single page because it's casual - tips for casuals and we pretty much just did a set of information but I don't know if your group worked out like this too but our group with the - when multiple - when say a question was coming up every week and it was a different question we ended up with heaps of pages because we'd do a new page for every question which I know there was an option to put it all on the same but I mean we were pretty limited in our wiki abilities so we just used to create a new page so we ended up with heaps.

KI

Yeah, we had like - you have your front page and then it would have like our name or the group or stage or whatever and so that would link to our page and then on the next one I had like - like each question for the week and then each one of those you'd click on it and it would link to the next page of information.

Facilitator

A page for each questions?

CP

That's tech.

Facilitator

Your team when you made new pages did you provide a base that...

CP

They were all under our name but I know that they were organised in the sense that when people went to us they could get to every page but I'm not sure that we put a link to the next - I don't remember really.

Facilitator

So how do you find a page that was created before?

CP

From memory they - like when you went to our group's names like we had the heading as the question. So if you wanted to know morning routines you went to that page but then you had to shut that page. Yeah, we should have linked. We should have linked but it was - it is a bit difficult. I would have liked to have done this if we had longer lessons because I think that an hour is a long time to get - is not a long time to get a grasp on - because you're learning and doing at the same time.

KI

Yeah, by the time you get your head around how to actually do it...

CP

How to do it you've then got 20 minutes...

KI

Especially if you had technical problems or you didn't know or you couldn't login and there was only one Kathy and there was like 35 people in the class, like you really - a lot of people just sat there for the whole lessons and then...

CP

Waiting to login.

KI

…yeah, waiting to log in or waiting to do something and then by the time Kathy came around it was like, it's 5 to, let's go, see you later. Like a lot of people didn't even write anything because by the time they got through the technical difficulties it was - the lesson was a waste, yeah.

CP

So I think it's a time thing. Like if we had a lot longer it would have been easier I think, yeah.

Facilitator

Easier. Would you discover there's anything new that you would like to do that has not been able to do so?

CP

I think that if - obviously with any kind of program like that the longer you sit on it the more you go, oh I've never noticed that before, what is that, how do I do it, whereas when you have an hour and you've got to get X amount of information down you don't have time to sit there and go, what does that button do. Like you learn the buttons you need and then you just use them. Well, that's what I've done anyway. I haven't really explored it, I've just learnt what I needed and - I mean, I know we could do it outside of home but again login. I keep going back, I can't login.

KI

Even - like I do have it outside and I just don't use it because…

CP

It's a - it's time. Like right now we've got so much to do, so…

KI

Yeah and maybe like when I start teaching and I need lesson ideas and things like that I'll use it but at the moment I'm not teaching, I've finished my prac. So I've got assignments and housework and washing and stuff to do. Like I'm - I'm not going to sit there and be like, let's read through everybody else's ideas. Like right now it's not a valuable tool for me but…

CP

In the future.

KI

...in the future it probably will be great.

CP

I have to say one of the teachers we had last year showed us a wiki that he had for his class and he set it up and the parents were invited to join it and - do you remember this [unclear]?

KI

No.

CP

The parents were invited to join and the kids updated it and he updated it and the parents could just go on and view what was going on and I remember of all the wiki things that we've done that is the most like valuable thing that I'll take away and I would actually attempt that with my class. Like I would try to have a class wiki that the parents can view because I think that's such an awesome idea. Like having them just - and it's private because you have to login to see it which is better than a website, normal website. I just remember thinking that was one thing I would actually really use.

So in that way I've taken - taken that idea away from all this work on it.

Facilitator

Thank you for that. [Unclear] and that's all the questions I have.

KI

Okay, thank you.

CP

Thank you. No problem, thank you.

Facilitator

Thank you. Hope I didn't take much of your time?

CP

No, that was...

KI

We weren't doing anything anyway.

CP

We were yakking away.

Interview MS & CW

Facilitator

Thank you for coming.   You are MS?

MS

Yes.

Facilitator

And CW?

CW

Yeah.

Facilitator

So there's a couple of questions.   First is, were you in one group or separate groups?

CW

We were in separate groups.

MS

Separate.

Facilitator

Separate groups.

CW

Yeah.

MS

Yeah.

Facilitator

So how did the collaboration happen, and what form was it happening in?

MS

Sorry, I didn't know you were recording this. I don't want to do it.

Facilitator

Oh, okay.

MS

Okay.

Facilitator

The recording is just for the transcription.

CW

Yeah, I know. That's fine with me. So, sorry, just repeat the question again.

Facilitator

Yeah, so how did the collaboration happen in your team?

CW

We just - the activities were given to us, so we had different type of activities. We just worked together on collecting. We collected whatever data we needed and got together, usually on the Friday when we were doing our lessons, and put our ideas together, and used the wiki to show our ideas that we had. We used - I guess wiki was more for us to use to provide information for the other students in our class, and use it as a way to - not just for now, but something that we can always go back to. So we've got things we can use as teachers and things like that.

Facilitator

So how did the collaboration between the team member - how many people were there?

CW

I was only in a group of two.

Facilitator

Only a group of two.

CW

Basically it was just, we were given a task. Whatever the task was, we'd go away, get our information, then come together and decide what we should put up on the...

Facilitator

So basically meet and work on it?

CW

Yeah.

Facilitator

So were the wiki used in any way in between the two of you?

CW

Apart from putting the information up, not really.

Facilitator

Not really.

CW

Because of the way it was structured - the class was structured - we really didn't have much time to do things through the wiki. It was more putting the ideas together on wiki. Both us learned off the wiki how to use the wiki properly and get it organised like that. Really, the collaboration was more getting together and working through ideas of how to - what we could do on the wiki to create our pages that we were creating.

Facilitator

So were - who used to do the authoring in the wiki? Is it like...

CW

I used to do it because I was - I'm very computer literate...

Facilitator

Okay.

CW

...and I pick up things very quickly, whereas the other person in my group just wasn't quite sure. So when we were going through to different things on the wiki, not only would I be putting the information in, but I'd also be showing the other person in my group how to do things on the wiki.

Facilitator

Okay, that's good. So most of the activity, when you were creating pages inside the wiki, you would be the one editing it...

CW

Yep.

Facilitator

...and then you'd work together what the content is?

CW

Yeah, exactly. Yeah, we'd work the content out together, and then usually I'd add it in.

Facilitator

So what do you see that the tools support group in that sense? In the whole assignment?

CW

Okay, so how would it...

Facilitator

Be useful to you?

CW

How it was useful to...? What I found it useful for, was, it gave you something which was very easy to put your data on. It provided you with an opportunity to present your data in a different way to what you normally would. It got you thinking about how you could do - from a classroom sense - how you could set up something like that in the classroom, and having your students working on different activities, and then you - able to collaborate that all together, bring it all together and then it's all on one thing for everyone to see. It makes it a lot easier to see everyone else's views and ways that people work on things differently. I found that it's very easy to use, very easy to work with. So it doesn't matter what skills the person has on a computer, they should be able to learn it very quickly, and that provides us with the opportunity to learn ways of setting up websites, or just using the wiki as something you put your work into and you can then use it to showcase your work.

Facilitator

So was it the first time you used the wiki?

CW

It was the first time. It was the first time I'd used a wiki.

Facilitator

How did you handle the first time? Was it difficult?

CW

The first time - as I said I'm pretty computer literate. I did three unit computing when I was at high school, so I usually - the best way I find that I work well with anything that I'm learning new is just to have a play with it. Try different things, see how that works. I just found it so easy to use. It's so self explanatory and it's basically, from what I can see, it's like a - just pretty much if you were using Word or Excel or any of those programs that people use daily, just on the wiki, that's all it is. I just found it very simple to use.

Facilitator

That's good. So when you play around with it, what do you see that's the thing that students can do? Probably you didn't actually use it the way you would, working with your...

CW

Yeah, I think we probably didn't use the wiki to - all the ability that it has and that was mainly because of the time that we had. We were pretty much only - because obviously we've got other things to do and we were only, really, meeting once a week and talking once a week. We didn't really, probably, use it to develop what we were collaborating, but we used it to show our collaboration. So what I - the wiki provided us with the opportunity to showcase it and I think that the tools that wiki has; being able to create new pages, linking things to websites, it's all very simple, how to do that. It's basically click a button and choose something that you want to do and you just go from there with it.

Facilitator

So if you are - is there anything that you think that's not useful? Or difficult to use?

CW

From my point of view, no, I think it was all pretty easy to use. I didn't find anything too difficult. I could guess if someone didn't have much computer skills, just the layout I think is a little bit hard to understand sometimes. So it might make it harder from someone to see what they're doing, and if they're not quite sure what they're doing, they could spend half an hour trying to work out what they're doing instead of doing the actual collaboration work. So I think the layout's probably the only thing that really could be very tricky on it. Apart from that I found it very easy to use.

Facilitator

So if you have workmates that never used a wiki before, how would you explain to this person how this tool would benefit him in collaborating, or in working on the work that they are supposed to do?

CW

Yeah. I guess to show them how - you'd first show them what you can do on the wiki. Show them the different things you can use and how you can set it up, and just start off, maybe, very basic. Just show them how to set up a page and then you can go from there. Just explain to them that this program can be helpful for you to talk amongst yourselves, because you've not only got the opportunity to put your own information there, you can also comment on it. You can show them that you can put your own comments there, you can talk amongst everyone on the wiki about the different things that you've been doing, and use it as a way to communicate apart from just face to face communication.

Facilitator

Okay. If the person knows more, then what would be the advance features that you feel that this tool can help you with.

CW

Yeah. I guess because I really only had a very basic, still very basic, look at the wiki, I haven't really - I've just done what I've needed to do. I think what I need, what you'd need to look at is ways that you can use the wiki to maybe create different things. So ways you can organise meetings or online - doing things online, like online chat or something like that and online meetings and using it as a tool to not only share information but pass on the information to other people.

Facilitator

Did you play around with any of the switches?

CW

I haven't really, yet, no. Again, it's just been very basic, trying to - obviously we've got a deadline to do everything so I just, okay, get this done. Now that, after this semester's finished, I've got a bit more time I might even - I'll probably go back and have a look and see what else you can do on the wiki, have a bit of a play with it. See where you can go further with it and ways you can use it.

Facilitator

You obviously know that it can be commented on. Did that happen, commenting on the pages?

CW

Not - oh, some people did. I haven't commented on any pages yet, but I know that feature's there and I think that's a good feature if you wanted to clarify something, or if you wanted to say, this is a good website that links with this, you can put that there. It can be valuable. Probably down the track when I'm further on, I might find something that's related to what we've done and I could say, oh look, I found this, this is related to what we've done, have a look at this.

Facilitator

Was there any collaboration in between teams?

CW

A little bit, but again, not much that I saw.

Facilitator

Well I think we've got enough.

Interview SD & SW

Facilitator

Shouldn't take more than 15 minutes.

SD

No problems.

Facilitator

I will time the time as well. So the question is - thank you for coming, it is SW?

SW

Yes.

Facilitator

And SD?

SD

SD, that's me. Yes.

Facilitator

So the question is about your experience when you are using the Wiki in this course. You don't have to focus on just the Wiki, can be any technology that you also included, using, while you are doing the course.

SD

For the course.

Facilitator

For the course.

SD

Okay, yep.

SW

Yep.

Facilitator

But probably the main thing is actually about the Wiki.   So first of all the question was that, were you in the same group?

SD

Yes.

SW

Yes.

Facilitator

Same group?

SD

Yes.

SW

Yes.

Facilitator

Same group.   How many groups of people in one group?

SD

I think two when we worked on the...

SW

Yeah, we were in pairs.

Facilitator

In pairs, so you are the same pair.

SD

…for the first lot of Wiki.

SW

No, we're not a pair, but yeah, the pairs actually changed from one semester to the next.

SD

Yes. Yeah, we had…

SW

There were some groups of three.

SD

Some had two, some had three. It was based on…

SW

Stage.

SD

Yeah, like what grades you were teaching at school. So yeah, so it's changed a little bit to what we are using the Wiki now.

Facilitator

That's okay. So during this time that you were working, whether in that previous or the current group, how was that, was there any collaboration, obviously there were, in what form were the collaboration took place?

SD

I think, for me personally, it was the first time we'd come across Wiki and we only had that one hour a week.

SW

Yes.

SD

So I think, probably most of us it was a whole new concept and I don't think we really even fully understood it. I think this time I've understood it better and even Cathy has used it in science as well.

SW

Yes, that's right.

SD

And we've sort of got even better again and I do understand the concept, even better than when I think we did the questionnaire.

SW

Definitely.

SD

I think we've realised what it can do. I mean, I suppose it's just like an information, for us it's a page where you can go and say, you know, resources because we are always after resources as teachers, of things that have worked for people.

SW

As far as collaboration goes, though, it was, because we were only together for that hour of the week; that was the only time we only really got to work with our partner. We didn't see them between one Friday to the next or anything.

SD

Or converse. No.

Facilitator

Working at the same place, on a computer.

SW

Yeah, so you might…

SD

Yeah, you just talked together.

SW

...by yourselves but we were still networking on the same page, or whatever.

SD

I suppose it was collaborative when we were together because they'd have an idea and they might put one in and then you'd have one. Sometimes it was similar, it was either websites, or lesson subjects.

Facilitator

Since then until now you say that you have discovered more use of the Wiki?

SD

That's right.

Facilitator

What would be the other things that you just recently discovered that you'd never used before?

SD

How easy it is to use.

SW

Yeah, I think mainly that's what it is.

SD

It's practice, isn't it.

SW

You get over that, what do I do, each step, point, and then you are able to actually use it properly. Whereas initially it was just like, oh how do I actually even edit a page or how do I add a new page or how do I do that.

SD

I'm not sure, maybe younger people found it easier, maybe. Maybe that is sort of the technology, maybe even at school, I don't know, has Wiki been around? Have schools done it? I'm not sure.

SW

Well I know that my son's class uses one.

SD

Do they?

SW

Yeah. So I think some of the younger people might have…

SD

Maybe they might have been more familiar, but I think for us it was really each - we only probably started it only half way through even the semester, it wasn't even the whole semester. So I felt just slowly, but now just yeah being able to edit the page is good, being able to find…

SW

Upload things.

SD

…other, yeah, uploading files from home, actually doing it, so I did a lot more at home on some of the other, the later ones, than I've done ever – we didn't do anything at home on the other because I suppose we just didn't understand it..

Facilitator

So why did you choose to do more at home?

SD

Because I had files at home. Also…

SW

That's when you had the time to do it too.

SD

Yeah.

SW

Because you didn't have a lot of time.

SD

Yeah, and when you're working collaboratively sort of it's harder but what it was I was able to upload, like a file that I'd already done for my assignment, and rather than retype it all in it was easier just to...

Facilitator

Load it.

SD

Yes, and so it was just a link. We just did it as a link and that was really good. I really enjoyed pictures, I found sort of some of the pictures I'd already had at home and so uploaded those into it. So I mean I probably, no I couldn't have done unless I'd had it on flash drive, I suppose.

SW

Yeah, that's what I was doing.

SD

If I had my document on flash drive.

SW

On flash drive.

SD

Right.

Facilitator

Would that be you or all the group members will be doing the same?

SD

Well I think for this last group...

SW

Most people would have worked on them at home...

SD

Probably at home.

SW

...probably a bit more than here even, yeah.

SD

Yeah, because I think it is hard in just that one hour. I'm not sure whether Cathy expected us to.

SW

But we had other things to cover as well. We couldn't just work on the Wiki the whole time.

SD

Yeah, and it was quick. I didn't find it difficult to do at home.

SW

No.

SD

Less interruption. Here it is, you know, more people, like now the battery just went on the computer, you know, so it's logged me off and so all those sort of things. But some people might prefer to do it here because it's done.

Facilitator

So what are the values that the technology has, this Wiki in particular, that offer you during this, for this part of your collaboration or your work is?

SD

Do you want it from a collaboration point of view?

Facilitator

From a collaboration point of view and also...

SW

How you use it.

SD

Personal.

SW

I think for me it's just been, it's good to have all of those resources that everyone is collecting in the one place. Some of them have tried to load them up on to like Blackboard or some of our other communication systems, it is much harder to find things again. You know that someone has…

SD

If you've seen it.

SW

…posted something.

SD

Yeah.

SW

And then to go through the hundred and something messages that are up there to try and find that one that you wanted is too hard. Whereas on the Wiki at least it's all there and ,…

SD

You know it's the one sort of topic.

SW

…find your way around a lot easier.

SD

You know that it is all on that topic that we've done. I mean, especially that science one I think was really good…

SW

Yep.

SD

…in the end, because we'd done this big assignment and it was really beneficial because it was all things we could use. So even though there had been different, or three different Wikis. I'm not sure, can we keep access to that when we leave uni?

SW

Yeah.

SD

Can we?

SW

Yes, I think so.

SD

So we can stay, have the same.

SW

Yep.

SD

Yeah, because that would be good. I just wasn't sure whether it is like your, you know, your university email address…

SW

Yeah, no, the latest one I've changed my email address so that I won't lose the connection.

SD

But from a collaboration point of view, probably not. I don't think we'd be updating it as a group any more. If we sort of wanted to add something we'd probably do it individually.

SW

Maybe, yeah.

SD

Because I mean a lot of us don't see…

SW

It kind of depends what kind of work you are going to get too, because if you're just casual teaching you might find some really good things that could be of benefit to other casuals, but if you've got your own class you are probably going to be really focused on just developing things for them.

SD

Yes. You mightn't go…

SW

Not maybe use those sort of resources as much. I don't know.

SD

I think for the science I'd go on again.

SW

Yeah, that's right.

SD

Check what people had done. Yeah, definitely.

Facilitator

So during this use of these tools what would be the difficult thing that you have to cope with?

SD

To come or what we've had to cope with?

Facilitator

What you have to handle, like finally you can use it comfortably?

SD

Yes.

Facilitator

What difficulty were you facing?

SD

Before?

Facilitator

I mean, even maybe now you are still facing?

SW

Using it. suppose some of the things like with some of us updating a page that you needed to access…

SD

Yeah, I think the fact you can only go on…

SW

…we weren't sure about how to handle that in a group.

SD

Yeah, I think it was sometimes hard if more, too many people were on.

SW

Especially when it was first setting up, like everyone is trying to edit the front page and you had your own pages and stuff and you just had to wait. I think once it's more set up though, there is less of those sort of hassles.

Facilitator

Difficult.

SD

I don't think difficult, was only I suppose the information is from us and we are fallible.

SW

Yeah, yeah, that's right.

SD

So we could be putting up stuff that's really not appropriate.

SW

Yes.

SD

You know, someone might have and you might use that as gospel, say that that is, oh we read it here and we can do that.

SW

Oh, that's going to work.

SD

Yeah, so maybe, but I mean that's the only thing.

SW

But that's the same as other resources.

SD

You've just got to...

SW

You've just got to use them and try them and see what happens.

SD

But I think from the Wiki itself's point of view, I don't see any difficulties to come, I think so long as – I'd probably try and keep a link, you know, open.

SW

Maybe it's like as long as everyone sort of uses the same formatting and stuff, it's hard...

SD

Yeah, if it doesn't change as time goes down.

SW

...if it's not standardised, I think.

SD

Yeah.

SW

You'd probably find it more difficult to find information if it wasn't all sort of structured the same.

Facilitator

Were there any strategy or what was done to organise the…

SW

I think that was Cathy's lead. So she sort of had the framework and it was basically a scaffold and it was cut and paste this page so that they all did look the same…

SD

Probably wasn't a lot of direct instruction, no.

SW

No.

SD

Probably. It probably was more fiddle around, wasn't it, but again whether younger people are used to fiddling around a bit more, maybe. I didn't feel quite as confident sort of with the page and in my pair I probably did let Jasmine take the lead more…

SW

Oh, okay.

SD

…so she was younger, and she seemed to sort of know her way, but again that was just time, you know, we did. I felt fine after that.

Facilitator

In your group pair did you create any additional pages or stayed…

SD

No, we didn't because I didn't think, I don't think any of us felt confident to add the pages, but since...

SW

Yeah, like after...

SD

...the second and third.

SW

The first one?

SD

Yeah, the first one. Did you add pages?

SW

No, I don't think so.

Facilitator

That's it....

SD

Now we have.

Facilitator

Started adding pages?

SD

We have, yeah. Yep. We've got links to websites, links to documents, references, links to different sort of book references. No, it is, it's amazing, and that was really only just still within this sort of, well you know, well in this semester.

SW

Last few weeks really.

Facilitator

So if you have a fellow up in [unclear] how would you convince or how will you say to this person well you should use this, you should use Wiki to do what, or what?

SW

In a school environment, you mean?

Facilitator

Not necessarily a school environment, but in there is collaboration, could be school, could be …

SW

I think it can show people what they can do.

Facilitator

What kind of use of Wiki would you think that….?

SD

I think I would be convincing them that from an education point of view, for us, they've got resources at their fingertip. There is ideas all there. So that would probably be the only thing for us. I don't know, how do kids use it at school, what do they use it for?

SW

I think mainly they use it, I'm not sure really how the class use it or how much they use it.

SD

So they use it at school?

SW

Yeah, they use it at school, but whether it is mostly a communication thing and so they put the homework, they get emailed their homework, but whether there is also a link to the homework activity on the Wiki as well.

SD

That they can read.

SW

They can read it.

SD

So, I'm not sure…

SW

…and those activities that they might be doing in class, or links, like web links and stuff that the teacher might want them to look at. I don't know what they do really.

SD

I suppose from that point of view it is , it is some good links, like it is rather than Googling lessons on planes, you could have a look and see and then hopefully people have done links and things like that.

SW

Hopefully it's a time saver.

SD

Yes. I wouldn't want it to take more time.

SW

Hopefully.

SD

Yeah, but that's probably, I mean that's all we've used it for.

SW

I know.

SD

You know, we haven't really used it as a communication tool or anything.

SW

No.

SD

It's really been a storage really, hasn't it?

Facilitator

Why is that now? [Unclear].

SD

I don't know. I don't think we've really – I think Cathy has wanted us just to provide information from this, in this setting.

SW

Yeah, I think so.

SD

All the times have been to provide, so our peers can benefit from what we're doing....

SW

See what we've been doing.

SD

...but we have not used it to communicate in any way.

SW

No.

Facilitator

Do you think that the Wiki can be used for that?

SD

I don't know. Can it?

SW

Can it? I don't know.

SD

You tell me. We don't know. We haven't used it in that way at all.

SW

And that's the thing too, the more you use it the more you realise what they can do and that takes time.

SD

With us as fourth years we are going, this is our second last week.

Facilitator

There is a feature to give comments on pages, your point of view.

SD

Okay.

SW

Yes.

Facilitator

That was in your...

SD

No.

SW

No, not really.

SD

No, I don't we ever – Cathy did.

SW

We weren't really encouraged to...

SD

Cathy commented to us.

SW

We weren’t really encouraged to comment on other people’s things. Maybe once we leave and we have actually tried the ideas then we might be able to put comments up there and I am not sure if the comments are open to everybody or if it is just Cathy at the moment is able to do that. I don’t know.

SD

Yeah, but we haven’t. No. I haven’t see any myself either.

SW

No.

Facilitator

I think then that’s about it. Great. [Unclear].

SD. Thank you very much.

SW

No worries.

Facilitator

Thank you very much.

SD

You’ve still got two more, have you?

16 Appendix H: Case 3 Data

The following are tabulated questionnaire data and interview collected for Case 3. The list of the questionnaire questions can be seen in Appendix A: Research Instruments.

Questionnaire response

Table 31. Case study 3 Questionnaire Response 1

Respondent:	BM	LL	JS	RS
Qn 1	Agree	Disagree	Neither agree nor disagree	Agree
Qn 2	Neither agree nor disagree	Agree	Agree	Agree
Qn 3	Neither agree nor disagree	Agree	Strongly Agree	Neither agree nor disagree
Qn 4	Neither agree nor disagree	Agree	Strongly Agree	Agree
Qn 5	Disagree	Disagree	Agree	Agree
Qn 6	Agree	Disagree	Agree	Agree
Qn 7	Strongly Disagree	Neither agree nor disagree	Agree	Neither agree nor disagree
Qn 8	Disagree	Disagree	Disagree	Agree
Qn 9	Neither agree nor disagree	Disagree	Neither agree nor disagree	Agree
Qn 10	Neither agree nor disagree	Disagree	Neither agree nor disagree	Agree
Qn 11	Strongly Disagree	Disagree	Agree	Agree
Qn 12	Strongly Disagree	Disagree	Neither agree nor disagree	Agree
Qn 13	Agree	Neither agree nor disagree	Disagree	Agree
Qn 14	Wiki: It was easy to build and add information to. However, the layout features are limited and restrict the design of the wiki.	Found the wiki page confusing to make and instructions were unclear. Have never used or looked at it.	Editing of the wiki page could be done anywhere with access to a computer.	Wiki, easy to enter in information, easy to navigate and find other students' work. The login process was hard and time consuming for a lot of students.
Qn 15	N/A	Used the wiki page and the Internet.	Youtube video research to demonstrate a variety of the experiments.	...google images

Qn 16	Spoke on the phone/email; allocated sections to work on	One person typed up the information that was found by another person.	Individual research that was brought together and discussed and then altered.	One did most of the work while the other typed.
Qn 17	Discussed it.	One person looked up information while the other typed it out.	Divided into equal parts of what we thought was a fair share.	We just worked out who wanted to do which parts.
Qn 18	No dramas	Good.	Combined well and responded to each others suggestions and comments on the direction that our work was heading.	Not always equal
Qn 19	Ok, but if I was teaching a topic I would still feel the need to background check all the information posted on the wiki.	If I knew how to work the wikis, it would be a good resource for when we teach.	A great way of editing that can be done by such a large number of people and formed the basis for an online tool to use in other subject areas. It is effective because anyone can access who has an Internet connection.	The access to information. Easy to naviagte.
Qn 20	The wiki allowed me to monitor what was being posted on our wiki.	It allows a lot of information and a variety of topics to be shared very easily.	Shared experiences of lesson experiences and how resources are utilised and implemented.	Sharing where everyone has an equal share. Where everyone has ideas and is willing to contribute them.
Qn 21	A great resource to introduce a topic. A good way to monitor each group members' contribution.	It supported collaboration, but like before, still don't understand how to work the wikis.	The future of sharing resources perhaps and an effective way to have equal share of input and resources.	I really valued the tools, particularly the IWB notebook software. The wiki is useful when sharing amongst a community.
Qn 22	No	No	N/A	No.
Qn 23	Not really	No adjustments were made.	Just reinforced my initial feelings of effective group work where everyone contributes but a different method of delivery.	Yes, I use them more often, I think about them as a realistic option. I felt I needed to make the adjustment so that I would be more open to using technology.
Qn 24	Wiki/email = learning as not appropriate for social. I'm not interested in social networking sites.	Learning purposes.	Learning purposes to develop learning experiences from combined input.	msn - social and learning wiki - learning facebook - social and learning skype - social

Table 32. Case study 3 Questionnaire Response 2

Respondent:	HS	LM	ES	CT
Qn 1	Agree	Agree	Disagree	Agree
Qn 2	Disagree	Agree	Neither agree nor disagree	Disagree
Qn 3	Agree	Agree	Agree	Agree
Qn 4	Agree	Neither agree nor disagree	Agree	Agree
Qn 5	Agree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree
Qn 6	Agree	Neither agree nor disagree	Disagree	Strongly Agree
Qn 7	Agree	Agree	Disagree	Agree
Qn 8	Agree	Disagree	Disagree	Strongly Agree
Qn 9	Agree	Neither agree nor disagree	Strongly Disagree	Strongly Agree
Qn 10	Agree	Agree	Strongly Disagree	Neither agree nor disagree
Qn 11	Strongly Agree	Neither agree nor disagree	Disagree	Disagree
Qn 12	Strongly Agree	Neither agree nor disagree	Strongly Disagree	Disagree
Qn 13	Strongly Agree	Disagree	Disagree	Neither agree nor disagree
Qn 14	We used a wiki. Using a wiki allowed both of us to alter the work for one another. It was easy to view and create a structured page. It was difficult to link to other groups work as their work may have been relevant or related to ours.	update pages.	Google and Wikipedia. They were easy to import data.	wiki. the wiki was easy to navigate and add links to. From memory, it was hard to edit the page easily.
Qn 15	We used other websites that provided us with information on the topic we were focusing on. We decided to use other websites as they provided us with greater detail and were the more knowledgeable source when it came to our topic.	Google and relaible websites for research.	I chose to use the word editing function.	facebook - to communicate who was doing what. We were already connected through facebook.
Qn 16	We were able to divide the work equally to then come	Very well. Everyone contributed and the task was complete.	Through collaboration and group discussion.	Mostly working together in workshops.

	together and combine what we had each discovered.			
Qn 17	We were happy to share responsibility and had sections that we each found interesting and wanted to know more about personally.	Good- everyone had equal roles.	Equally and in a just manner.	We both suggested to do our own parts. In the end, we both ended up finding different resources through our own seperate research.
Qn 18	We all worked well together.	Excellent. Shared ideas and everyone was heard.	Effective and cooperative.	Effective. We both were focused on achieving the same outcome, which helped lessen any confusion that may have arisen.
Qn 19	A wiki is a great resource for students to develop and discuss ideas, bring up questions and display findings on scientific information.	Good at keeping track of information.	No, I do not find it effective. I think it could be and that it is a good idea however I found a lot of people were just copy and pasting things from google.	Wikis are great for sharing ideas for the purpose of the unit. For teachers collaborating online from different schools, I feel that blogs and twitter could be used more effectively (these accounts are more personal, where teachers focus on a particular area of interest [eg teaching science, special ed, using technology] and can share ideas/resources online).
Qn 20	In group work the work must be equally done by all parties otherwise the work isn't as strong as what it could be. The wiki allowed each member to evaluate each others work and to offer suggestions for their part.	Helped with the ideas. We could see how others were going.	I expect an equal amount of sharing and a equal amount of effort to go into resource gathering however I did not find this by using the wiki.	Sharing of ideas and workload. The wiki allowed us both the chance to upload and edit our page.
Qn 21	A wiki is a great and easy resource to use. It allows for group collaboration and can display a range of information easily.	Valued. Very easy to access and alter info.	I do not value these tools. I find that there is not enough effort being taken by students to really ensure the that we are getting the best out of it.	Highly. This is a time-saving way of attaining resources and content information.

Qn 22	No	No.	I think that email has been fantastic when working with a group.	No.
Qn 23	No	No. Have always valued team work and realised the importance of it.	No, no adjustments made.	No.
Qn 24	The wiki I have not yet been able to use for learning purposes, but the other websites I have been able to use for both learning purposes and social purposes.	learning purposes only.	Tools were used for social eg. email and only used wiki when I was told I had to.	Wiki strictly for learning purposes, while our communication through facebook was more on a social level.

Table 33. Case study 3 Questionnaire Response 3

Respondent:	**JT**	**MP**	**KT**	**KW**
Qn 1	Agree	Agree	Strongly Agree	Agree
Qn 2	Neither agree nor disagree	Agree	Neither agree nor disagree	Neither agree nor disagree
Qn 3	Agree	Agree	Strongly Agree	Agree
Qn 4	Agree	Agree	Strongly Agree	Agree
Qn 5	Agree	Agree	Strongly Agree	Agree
Qn 6	Agree	Agree	Strongly Agree	Agree
Qn 7	Neither agree nor disagree	Agree	Strongly Agree	Neither agree nor disagree
Qn 8	Disagree	Agree	Strongly Agree	Neither agree nor disagree
Qn 9	Agree	Agree	Strongly Agree	Neither agree nor disagree
Qn 10	Neither agree nor disagree	Neither agree nor disagree	Strongly Agree	Neither agree nor disagree
Qn 11	Agree	Agree	Agree	Disagree
Qn 12	Agree	Agree	Neither agree nor disagree	Disagree
Qn 13	Neither agree nor disagree	Agree	Agree	Agree
Qn 14	wiki, collaborative editing	wikis. The tool worked a lot like a word processor. Also we can change parts of the wiki at our own leisure.	Wiki. I found it easy to find lesson ideas and tips that other students had posted.	wiki and email
Qn 15	n/a	We used google alot.	I used other Internet sources to help with my wiki. i think using	email & websites for resource info

			other tools will enhance the content posted on the wiki.	
Qn 16	n/a	We maintained contact through other tools such as facebook. But overall I found there wasnt too much communication.	We all worked collaboratively sharing the work load. we all contributed to the task by coming up with a range of ideas to research and discuss.	Group composition changed over time. Typically, each member took it upon themself to update/ contribute to the wiki page
Qn 17	verbal discussion	We made sure everyone had something that they were responsible for.	We each picked topics of personal interest to research.	This was done informally.
Qn 18	average	The team was very collaborative.	I think my partner and i worked well together, we shared ideas and developed new ideas together.	Some members contributed more than others
Qn 19	potential to overcome distance and communicative barriers	It depends on how the tool is scaffolded. Students need to see the benefits of using wikis to learn and to build knowledge.	I think the wiki is very effective as a teacher resource. It provides teachers with useful ideas they can use in the classroom without having to subscribe to websites. Its a good way of sharing your own teaching experiences with others.	I think its value is 2 fold-- first, the way information/ teaching resources are organised and accessible and 2nd- showing us how to use/create a wiki - an activity we could have kids build and use in our classrooms
Qn 20	provides a community canvas of ideas and work	I want everyone to play their part. THey need to be willing to communicate their ideas and be willing to use the same tools. Wikis help because members can add and change information at their own pace.	Collaborative group work allows me to share with others my ideas, lesson experiences, quires and concerns i have with content and teaching. The wiki helps with these needs as it allows teachers/ student to share ideas, teaching methods, lesson activities and content.	Part of the value of collaborative work is in exchange of ideas- the wiki works well for this- it is less easily used for sharing and building upon an idea
Qn 21	helpful but not crucial.	These tools are valuable, but again it depends on the groups willingness to use it to its full potential.	I greatly value this online tool because it is easily accessible and helps with my professional learning and collaboration with other student teachers.	I think it's quite a useful resource
Qn 22	n/a	No	no	no

Qn 23	no	I think we were more aware of what is required for the activity. Everyone should know where everyone is at in terms of providing information for the resource.	Yes, as i realised how effective group work and using the wiki could be for teaching.	n/a
Qn 24	wiki has been used for educational and social purposes	Wikis	I have used the wiki for learning and educational purpose. The wiki is appropriate for educational use.	wiki- learning blog- learning chat- social & learning

Table 34. Case study 3 Questionnaire Response 4

Respondent:	**DQ**	**JP**	**HS2**	**LR**
Qn 1	N/A (do not use wiki)	N/A (do not use wiki)	Neither agree nor disagree	Neither agree nor disagree
Qn 2	N/A (do not use wiki)	N/A (do not use wiki)	Neither agree nor disagree	Strongly Agree
Qn 3	Agree	N/A (do not use wiki)	Neither agree nor disagree	Strongly Agree
Qn 4	Agree	N/A (do not use wiki)	Neither agree nor disagree	Strongly Agree
Qn 5	N/A (do not use wiki)	N/A (do not use wiki)	Neither agree nor disagree	Strongly Disagree
Qn 6	N/A (do not use wiki)	N/A (do not use wiki)	Neither agree nor disagree	Strongly Disagree
Qn 7	Agree	N/A (do not use wiki)	Neither agree nor disagree	Strongly Disagree
Qn 8	N/A (do not use wiki)	N/A (do not use wiki)	Neither agree nor disagree	Strongly Disagree
Qn 9	N/A (do not use wiki)	N/A (do not use wiki)	Neither agree nor disagree	Strongly Disagree
Qn 10	N/A (do not use wiki)	N/A (do not use wiki)	Neither agree nor disagree	Strongly Disagree
Qn 11	N/A (do not use wiki)	N/A (do not use wiki)	Neither agree nor disagree	Strongly Disagree
Qn 12	Agree	N/A (do not use wiki)	Neither agree nor disagree	Strongly Disagree
Qn 13	Neither agree nor disagree	N/A (do not use wiki)	Neither agree nor disagree	Strongly Agree
Qn 14	I have not looked at the wiki since opening it last year. What is difficult is finding the time to get acquainted with these tools. The only tool i use is email. there was no collaboration.	did not do Tep subjects in 2009.	wiki	I found that creating this Wiki was a waste of valuble time, as we only get 4 SCiTeh pracs per semester and didn't learn much at all about how to teach SciTech, we just wasted time on this Wiki instead.

Qn 15	Google and youtube.	did not do Tep subjects in 2009.	google	?
Qn 16	very little collaboration. the bare minimum was done.	did not do Tep subjects in 2009.	we completed team work	We did it together on one computer during class time.
Qn 17	very quick decision	did not do Tep subjects in 2009.	we worked together	Easil as we were all friends anyway and so we just played an equal role and did equal amounts of work to make it fair.
Qn 18	very poor.	did not do Tep subjects in 2009.	collaborative	Good
Qn 19	i still don't fully appreciate it's function/use. I hear many good things about it but have never used it.	did not do Tep subjects in 2009.	it is good as i have never used one before	It may be valuable in the future when I start teaching.
Qn 20	At university we are taught much about collaborative work and it's benefits but the TEP subjects are so rushed that we rarely ever get to actually do any. I don't know how the wiki supports group work.	did not do Tep subjects in 2009.	equal sharing	Equal input by all.
Qn 21	No value to me I have not used them.	did not do Tep subjects in 2009.	i value them	Not much.
Qn 22	no.	did not do Tep subjects in 2009.	no	No.
Qn 23	no.	did not do Tep subjects in 2009.	no	No.
Qn 24	no.	did not do Tep subjects in 2009.	leaning purposes	Learning purposes

Table 35. Case study 3 Questionnaire Response 5

Respondent:	**ES2**	**FP**	**ML**	**VP**
Qn 1	Disagree	Agree	Strongly Agree	Agree
Qn 2	Agree	Agree	Disagree	Neither agree nor disagree
Qn 3	Agree	Agree	Strongly Agree	Agree
Qn 4	Agree	Neither agree nor disagree	Strongly Agree	Agree

Qn 5	Neither agree nor disagree	Neither agree nor disagree	Disagree	Neither agree nor disagree
Qn 6	Agree	Agree	Strongly Agree	Agree
Qn 7	Disagree	Agree	Strongly Agree	Agree
Qn 8	Disagree	Neither agree nor disagree	Strongly Agree	Neither agree nor disagree
Qn 9	Agree	Agree	Strongly Agree	Neither agree nor disagree
Qn 10	Neither agree nor disagree	Disagree	Neither agree nor disagree	Neither agree nor disagree
Qn 11	Strongly Disagree	Disagree	Strongly Agree	Agree
Qn 12	Strongly Disagree	Disagree	Neither agree nor disagree	Neither agree nor disagree
Qn 13	Agree	Agree	Strongly Agree	Agree
Qn 14	Apart from working together at university, we used our university email to stay in contact when planning changes to be made to our wiki.	we used the wiki for collaboration. I found it is easy to attach web based links	wiki, easy to view others work, difficult to remember password	The main tool used was the wiki. Aspects that were easy were the fact that you could log onto the wiki no matter where you were. Difficult aspects were just when we had technical issues e.g. freezing or dropping out.
Qn 15	We used Internet searches on google to gain images to support what we were saying. This was to make clearer what we were explaining and/or expecting.	links and documents makes wiki more interesting	We used other websites to find information, the tool was only a scaffold at that point, now it has information.	We used email because it was a quick way to communicate between us.
Qn 16	We worked together at university and stayed in contact via email.	really well	it was easy	Really good. We split the workload up between us and did our parts and helped each other if we needed it.
Qn 17	We decided in the first session (of each semester) who would do what and both members completed their delegated tasks.	no problems	we said you do this and I'll do this???	We split the tasks up evenly.
Qn 18	Well done.	team worked well everyone assited with the wiki and contributed	collaboration was good, we worked well together.	Really good. We had great communication which helped tremendously.
Qn 19	I can see how it is of benefit, however I think it would have	the wiki will be great as an external resource to gain	this is a fun interactive way of sharing class research and	The value is great if the resources on the wiki are

	been better for us as upcoming teachers to have been taught how to set one up, not just focusing on adding information to one.	information on science subjects	would to contribute to a quality learning environment in the classroom and beyond. Therefore the sharing aspect is very effective, it can be shared between students, schools, etc	worthwhile. It is so effective because it can be easily accessed.
Qn 20	Wiki is an easy way to allow large numbers to gain access to vital information to make their teaching easier.	it made sharing our teams work easier with the rest of the class	we have contributed finding and information. It is all there just a click of the mouse away.	In group work we need to share the skills we each have.
Qn 21	The tools helped produce the final product.	i dont think the wiki was the most influential thing on our teams collaboration we worked well in general. The wiki is a very valuable source of information	I would like to do this in the classroom - the wiki didn't really contribute to the collaboration on a group by group basis but it did on a macro scale.	i do value it but am still getting use to using all this technology.
Qn 22	No.	no	no	No
Qn 23	No.	no	no	No
Qn 24	Email was used for learning purposes only.	havnt used a wiki before	this has been helpful for learning processes however it required everyone to research through the wiki's which is great if you are all involved in a similar topic/project but useless if the information is not relevant. may as well go on the Internet. this was used for learning purposes	Email- definitely been used for both purposes and i find is appropriate for both and efficient. Wiki- only for learning purposes. they are appropriate and a very good resource.

Table 36. Case study 3 Questionnaire Response 6

Respondent:	**AS**	**TF**	**JC**	**JS2**
Qn 1	Neither agree nor disagree	Strongly Agree	Agree	Agree
Qn 2	Agree	Disagree	N/A (do not use wiki)	Disagree
Qn 3	Agree	Agree	Strongly Agree	Agree
Qn 4	Agree	Agree	Strongly Agree	Agree
Qn 5	Neither agree nor disagree	Neither agree nor disagree	Agree	Neither agree nor disagree

Qn 6	Disagree	Neither agree nor disagree	Strongly Agree	Strongly Agree
Qn 7	Agree	Neither agree nor disagree	Agree	Agree
Qn 8	Disagree	Disagree	Agree	Agree
Qn 9	Disagree	Agree	Strongly Agree	Agree
Qn 10	Disagree	Strongly Agree	Agree	Agree
Qn 11	Disagree	Neither agree nor disagree	N/A (do not use wiki)	Strongly Agree
Qn 12	Disagree	Neither agree nor disagree	N/A (do not use wiki)	Agree
Qn 13	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree
Qn 14	Email - very accessible, no passwords required	The wiki front page	We spoke mainly as we each had turns of typing and entering data	Email
Qn 15	I prefer Word, Powerpoint and email. I have not used wiki in teaching yet.	youtube	web search	Verbalising
Qn 16	We are friends so we discussed the work over the phone or by email and each had a certain amount of work to complete in wiki	team work	fantastically well!! we spoke and communicated clearly with each other which resulted in a great outcome	We shared cooperatively
Qn 17	We basically volunteered to do certain amounts based on our prac/study commitments	we did it in class.	we spoke about elements each other wanted to take on and this allowed us to assign jobs	Shared evenly
Qn 18	We worked well together but prac/study commitments resulted in both of us not completing all our wiki commitments	Very Good.	functional through communication	50 50
Qn 19	In general, I think the wiki is a great idea but it is very affected by students' lack of time to complete wiki entries due to work/study/prac and family commitments	effective	the wiki was great!	Very effective, I will use it in the future
Qn 20	Sharing information verbally and sharing workload to complete task on time. Wiki didn't support those needs	We used a wiki in another class for an assessable task. It works well in group work to be	equal sharing	Even distribution

	because passwords made it difficult to access and added to our workload.	able to share the load and information.		
Qn 21	See answer above. I value wiki in theory but the reality has not benefitted me. I do not log onto wiki to use information in lessons.	I'm not sure what the tools are.	the tools are crucial	Invaluable
Qn 22	We both preferred email, word and powerpoint.	No	no	NO
Qn 23	I found this experience frustrating.	No	we spoke openly about it	NO
Qn 24	Cannot comment as I don't use them	Learning purposes	social	NA

Table 37. Case study 3 Questionnaire Response 7

Respondent:	**MA**	**LA**	**TM**	**DQ**
Qn 1	Agree	Neither agree nor disagree	Agree	Agree
Qn 2	Disagree	Neither agree nor disagree	Disagree	Neither agree nor disagree
Qn 3	Agree	Neither agree nor disagree	Strongly Agree	Strongly Agree
Qn 4	Agree	Neither agree nor disagree	Agree	Strongly Agree
Qn 5	Disagree	Neither agree nor disagree	Disagree	Neither agree nor disagree
Qn 6	Agree	Neither agree nor disagree	Agree	Agree
Qn 7	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree
Qn 8	Neither agree nor disagree	Neither agree nor disagree	Agree	Neither agree nor disagree
Qn 9	Neither agree nor disagree	Neither agree nor disagree	Agree	Agree
Qn 10	Agree	Neither agree nor disagree	Neither agree nor disagree	Agree
Qn 11	Agree	Neither agree nor disagree	Disagree	Agree
Qn 12	Disagree	Neither agree nor disagree	Neither agree nor disagree	Disagree
Qn 13	Agree	Neither agree nor disagree	Disagree	Neither agree nor disagree
Qn 14	Internet	wiki	Producing a fact sheet, editing. Cut and past was difficult due to functions in the wiki.	wiki
Qn 15	Internet	email, quicker ans easier	Internet. Gather information.	email.

Qn 16	Delegation, sharing of responsibility	good	Communication and shared ideas.	teamwork
Qn 17	Discussion of strengths and weaknesses, discussion of abilities and physical and financial constraints	good	Equality in the task.	agreement
Qn 18	Solid	good	excellent	good teamwork
Qn 19	Effective tool to use, valuable for students	its ok, could do without it.	Sharing of information effectively. Sourcing information.	valuable tool. very useful. i'm too busy to use it fully.
Qn 20	Communication	I prefer to do my own research and not rely on others.	Communicating knowledge.	open to all . accessability
Qn 21	Very valued	not much	They are valuable resource to use in team work.	usefull as a tool only
Qn 22	No	no	No.	no.
Qn 23	No	no	No.	not really.
Qn 24	Learning purposes	learning.	Both purposes, both are appropriate.	not social.

Interview transcript

Interview HS & ML

Facilitator

So thank you for participating - it's good feedback. I would like to follow up with just a few questions about the use of this with you particularly.

But before that maybe, you were - what's your name?

HS

HS.

Facilitator

HS and...

ML

My name's ML.

Facilitator

ML. Where you in the same group during the project?

HS

No.

Facilitator

No?

ML

No.

Facilitator

Separate group?

HS

Yep.

ML

Yep.

Facilitator

So, how was the collaboration happening in each of your groups?

ML

Basically I sat down with my team member and we just talked about it, figured out what topic we were going to do, and thought about who would be reading it, and just put it together. I don't know. It wasn't that - it just happened. We didn't really have to think about it too much in terms of group work collaboration. How about you?

HS

We chose a topic that we were both interested in, and wanted to probably know a little bit more, but also in that teaching - setting it out in a way that kids would easily be able to read it as well.

Facilitator

So there were two people...

HS

Yeah.

ML

Yeah, two people.

Facilitator

...per group. So how did you work with it in Wiki, together with your teammates. Do you always meet together to work on it, or do you work from home?

ML

We did it in class together. So, yeah, we just got it all done pretty quickly in class together. I'm trying to think - I think we actually did get a few things ourselves and then put it together, but most of the work was done in class together.

Facilitator

When you were doing it yourself, is it on Wiki or do you do it off Wiki and then you...

ML

No, we were sitting at the same computer. Yeah, actually thinking about it - it was a while back so - thinking about it, I think there was one lesson where my partner wasn't there, so I did a fair bit, and then he came along and added a bit to that.

HS

We worked together and we each collected some information. We just decided which was the more relevant information for our topic. So we went away and did our own separate research and then came together and put it together.

Facilitator

So when you're doing research separately, you're not adding it on the Wiki?

HS

No. Not at that time.

ML

No.

Facilitator

So, how do you collect the...

HS

So we were just typing out the information and maybe just printing it out on a sheet and then relaying it onto the Wiki.

Facilitator

Oh, okay. So when you meet together you can bring together the Word document or something, and then you have a look together...

HS

Yep.

Facilitator

...and then you upload it together.

HS

Yep.

Facilitator

Do you find it easy to use Wiki?

ML

Yeah, it was easy.

HS

Yeah, it was really good.

ML

Yeah. We didn't use a Word document, we went on Google, researched our topic, looked through other Wiki's, got some information and then copied and pasted some ideas and then summarised and did it all on the Wiki. So we used that as our - yeah, just the program to get that done. It was really easy to use actually.

HS

Yeah.

ML

The hardest thing about it was remembering our passwords.

HS

[Laughs]. Yeah, that's probably true. Like I found it really easy to set it out really well - add in the pictures if we needed pictures and things like that. So I thought that was really good.

ML

Yeah, absolutely.

Facilitator

So you used pictures?

ML

Yeah, pictures.

Facilitator

What other media did you upload to the...

ML

Um, I think we've even got a YouTube.

Facilitator

You've got a YouTube?

ML

YouTube, pictures, text.

HS

Then external links as well.

ML

Yeah, links.

HS

Links to other websites that could be beneficial.

ML

Yeah, and then of course the feedback from other students - the blogging stuff going on.

Facilitator

Do you find it useful, this feedback process with the other groups?

ML

Ah, yeah. It was nice to see that someone had actually looked over it, read it and yeah, we got some good comments, our group, so it was nice to hear. Yeah, it's always good just hearing other people's perspectives on what they think of your site.

HS

It helps you recognise the things that you've done well, and the things that you need to improve. The information that probably wasn't so relevant to your topic and things like that. So that was really good.

Facilitator

So overall is it useful, the Wiki?

HS

I think so. It provides us with all these new - like different resources and lesson plan ideas and things like that. Because everybody's topic was different and it relates to a lot of things that we need to teach in primary schools. So I think it's really beneficial.

ML

Yeah, it's great from a teacher's point of view. But it's also great from a student point of view and from the point of view of when you're actually in the classroom, like, doing that with our students, would be fantastic. Just the process - it would be really engaging. Then they could look at other people's work and yeah, they'd be just looking at information in a different way and I think that would be using a higher order of thinking skills, which would be great.

Yeah, it's just something different. Not just doing an information report which is so boring. This is a whole class collaboration and it's just really cool. It's interesting.

Facilitator

So how would you imagine it with a whole class collaboration using Wiki?

ML

I mean, let me see - like say we were doing a broad topic, say colonisation of Australia, you could have different groups working on different parts. You could have one group doing Captain Cook's voyage, another group doing the First Fleet, then early colonisation, and then Aboriginal's perspective. Then you could put it all together and actually present the work that the people have done. Or you could get the students to log onto the Wiki's, look them up, and then do a presentation to the whole class back of what they've found out from the process.

Facilitator

That would be interesting.

ML

Yeah, I reckon that would be really cool.

HS

Yeah, I definitely see the benefit of students using a Wiki. It's a definitely more engaging process I think. It's something that can be kept for a really long time. So you could have a Year 5 class for like 10 years, and every year...

ML

Oh yeah.

HS

...you can go back over and go, well this is what these guys did last year, as examples and things like that. So I think it's really beneficial.

ML

Students could set up their own ones on the Internet with other schools or friends - well not friends, but just anyone - like similar interest groups. But if they wanted to explore certain topics then they could set up their own Wiki and get a perspective from someone in South America or Europe or something.

Facilitator

If you're a teacher, how would you think - what difficulty or challenges would you think you would be facing if you tried to set up those ideas?

HS

I think for teachers, you've got to have constant overview of what the students are doing. So you've got to be aware of what they're doing. If you're asking them to comment on each other's work, just keeping an eye over that and making sure that the comments are relevant and appropriate. So there probably could be times when students are doing something silly, but then you've also got that documentation of what they've done.

ML

I think you'd have to be really explicit in your teaching and show them - model how to use it, because a lot of students would be struggling just to log in and just figure out how to use it. But once you showed them it would be easy. But they just need that initial instruction of how the structure works. Just to get the whole concept of it, because for younger students it might be a bit abstract. But if you discussed it, then they'd get the hang of it, I think.

HS

It's definitely - using Wiki is definitely something for stage three, maybe late stage two, but I don't...

ML

I think they could do it but - yeah.

HS

There'd be a lot more guidance in stage two, but stage three...

ML

You see I'm thinking stage two, because that's the class that I'm on at the moment, and you would need guidance. But I think a lot of them would be capable. But some of them would, yeah, maybe a bit too - a bit over their head.

HS

But you could spend class time doing their research and then if they access it at home, writing it up at home, or even in computer time or something like that.

ML

I reckon they'd get the hang of it. It's just because it's a new concept and, like I said, they're used to doing information reports where they just go and get the information, copy and paste it into a Word document, and that's what they're used to. But to go that little bit further, probably wouldn't take that much. It's just a matter of doing it and them getting used to it.

If you started them off early, just doing simple ones - if you just did a class discussion about something and you just posted a sentence about what they think about it, it wouldn't have to be detailed information, it might be just from their own experience or background knowledge and just do it that way. Just keep it really simple for the younger years.

Facilitator

Well hopefully you can try implementing your ideas.

ML

Yeah, absolutely.

Facilitator

We have a project that involves Year 4, Year 5 actually, using a lot of scaffold, but they're using Wiki as well. Interesting. Cathy got involved in the project actually.

ML

A lot of students, they know about Wikipedia - they know Wikipedia back to front. So I guess they're getting the idea. When we do - for computers, they go on Wikipedia all the time. So they're starting to learn about it.

Facilitator

Okay, well thank you.

ML

No worries.

HS

That's alright.

ML

I hope that was helpful.

Facilitator

Thanks for your help.

Interview JS, CH & AN

Facilitator

Thank you for doing the questionnaire and participating. Can you say your name?

JS

JS.

CH

CH.

AN

AN.

Facilitator

So this is only a couple of questions looking at a couple of aspects. So were you in the same group when you were doing the project?

AN

No. Oh, we were.

JS

No. I was in…

Facilitator

A separate group but you were in one group?

AN

Yes.

CH

Were we?

AN

Yes.

CH

Oh.

AN

We did the...

CH

We must have...

AN

The earthquake one.

Facilitator

There were two persons per group were there?

CH

Yes.

AN

Yes.

Facilitator

Same with your group itself. So how did the collaboration happen in your group? How did you work together?

CH

I guess we just brainstormed what we thought might be good to…

AN

Include.

CH

…include and then we kind of just went about and got our own thing and then we just came back together and figured out what we were going to put together and type up. So it was all about just breaking up the workload.

AN

Yes.

CH

Figuring out how we could collaborate and put our ideas together.

Facilitator

Were you both editing the wiki?

CH

Yes.

AN

Yes. We both did.

Facilitator

Both editing the wiki?

AN

Yes.

Facilitator

So were you working together offline first before you...

AN

We worked in class more so together and that's where we edited. But we came with the ideas before.

Facilitator

And your group?

JS

Yes, I think we were looking at YouTube videos because we wanted to include one on the wiki. So we both looked at them. We didn't add anything on the wiki until we showed each other. Then we edited when we were in the class. So we both saw it at the same time.

Facilitator

So what other media did you use in the wiki? YouTube?

JS

YouTube.

AN

Links, Internet links.

JS

Images.

AN

Document links

CH

Images.

AN

Yes, images.

Facilitator

Did you find it easy to use the wiki?

AN

Yes.

CH

It's pretty straight forward.

Facilitator

Were there any difficulties?

JS

I found it quite easy. I was showing other people how to add YouTube videos in my class. You just play around. It's pretty logical once you get an idea.

Facilitator

Did you use one before?

AN

No.

JS

No.

AN

Never have.

JS

Never once.

Facilitator

So this is your first time using a wiki?

CH

I've seen them before.   But I haven't really engaged in one.

AN

I hadn't heard of them.

Facilitator

What kind of wiki have you seen before?

CH

I did a computer class last year I think.

JS

I've seen one in schools.   I think it was called Moodle or something like that.   I've never used it until then.

Facilitator

So did you find the use of wiki in your project useful?

CH

Yes.

AN

Oh now yes, definitely.

JS

I used it for another subject.   It was useful.   I think I got an HD for it and that's quite rare.

Facilitator

Were you required to use the wiki in that subject?

JS

No, it was to come up with a way to delivering content or something like that.   I found that was easier.

Facilitator

Were you working alone or with...

JS

It was just alone.

Facilitator

Just alone and you used the wiki?

JS

Yes. But the whole idea was to come up with the base for them giving it to other people in our course. So I broke it up into KLAs and other ideas and stuff. Lesson ideas and things…

Facilitator

Do you imagine you will continue using the wiki or make up your own wiki for other purposes?

AN

I don't know if I'll make up my own. I found it difficult. But in terms of using it as a resource, definitely I'll use it again.

Facilitator

So do you use it in class when you are teaching?

AN

I haven't yet. But when I went on to do the questionnaire and do the comments I was looking through them all. Got a variety of ideas that I can use.

Facilitator

What sort of ideas do you look for?

AN

Like experiment ideas, testing certain things that are associated with different content areas of science syllabus.

Facilitator

Have you tried to implement this in your teaching or in school?

CH

I'd use it with kids.

Facilitator

The kids?

CH

I think it's great to get them involved with technology considering that our world's moving towards technology. Especially our education. But I guess you could use it with your class and it could be like an ongoing assessment. They could add on to it and have homework where they just have to go on to the wiki and write up a post or...

JS

I would probably use it for older grades only.

CH

Probably five or six.

JS

Five or six, yes.

Facilitator: Five or six?

JS

Because I had Year 2 and they still couldn't quite type into websites properly. So definitely for older kids.

Facilitator

What would be your challenges if you tried to use that the way you have mentioned?

CH

Access.

JS

Computer access.

Facilitator

Computer?

AN

Yes.

CH

But most schools...

JS

At schools itself.

CH

...have computers. Most people have computers at home.

JS

At home I think it would be alright.

CH

Yes, I guess access could be one of the issues. Internet, things going wrong. So you kind of...

JS

What gets put on there.

AN

Yes, control...

CH

Controlling what they put on there.

Facilitator

But the use of the wiki itself you wouldn't see any difficulty to teach this to the kids?

JS

No. I mean they are so clever nowadays. It wouldn't take...

CH

They know more than us. They do.

JS

...for them to pick it up. Because I didn't really have computers when I was growing up. But now kids are just everywhere. So I'm sure they will pick it up easily.

CH

Yes, definitely.

Facilitator

So in this exercise that you are using in wiki, what would be the value of wiki itself using in your collaboration in your assignments?

CH

It's a better source of getting information.

AN

Yes, like grouping information together for one easy access point.

JS

Doesn't waste time, perhaps.

CH

Especially for teachers. Because a lot of that stuff it takes forever to find on the Internet. It's good to get someone's personal input and experience kind of thing. Instead of just making it up, which is what I always do.

JS

So as teachers we'll probably all look at it in a similar way how we can use it in class. If it's not useful then I don't think we'd put it up there. So that would be a good way of filtering the information.

CH

To the point.

Facilitator

Did you also use the commenting?

CH

Yes.

AN

Yes, we did.

Facilitator

Was that useful?

AN

Yes.

JS

A lot of people different ideas of how to start experiments. Some people wanted to - because we have to investigate a lot of things and you don't want to give away too much of what is going to happen. The experiment I came up with, I was going to do, everyone was commenting on mine saying, you should tell them what's going to happen before they actually do it. But I thought that would ruin the whole investigating for the experiment.

CH

Well I don't think you should tell them. The whole point of an investigation you are supposed to figure out what happens.

JS

So yes, so that's where the differences occur I think in some people's views of how to conduct science. But other than that, that's the main thing.

Facilitator

But does the comments function in wiki help you to communicate this?

CH

Well if there is something you really need to say, then obviously the comments are good.

JS

Or if some other people don't understand something.

CH

You can add if you've got other information to put on there or pose a question that's good, it can get people thinking and adding to the wiki.

Facilitator

So were there any communications where people were commenting on your pages and you respond to those comments where that happened?

CH

Not often.

AN

No, because we haven't got many on there for ours.

JS

I think I've got about three and I replied back to each of them.

CH

I think if it was…

JS

In one thing that I'm not sure of, I've not checked it again.

CH

I think if it was a different wiki where people were always on it then you would get comments but I…

AN

I don't know how many comments…

CH

I don't think that…

Facilitator

It's okay for you to continue.

CH

If it was like a wiki that people would always go on constantly for something that they were more interested in, or if it had a specific purpose. I think the only time people would go onto the one we did was when we had the science tutes, or when we had to go onto it. Or when we needed stuff for prac or for the school we were teaching at. But other than that I don't think it's a constant. I don't think people go on it constantly.

AN

To comment.

CH

Unless it was something else like a different type of wiki like...

JS

Facebook?

CH

Generalised giving information - Facebook every day. But like if it was - I don't think you know what I'm saying.

AN

Yeah I understand.

JS

It's just a hassle to log into.

AN

The whole purpose of that wiki...

CH

The only way you are going to go onto the wiki all the time is if it's got everything you need whenever you need it and you'll need it all the time. If it was a wiki that had all the KLAs in it, had lesson ideas, worksheets, activities, whatever then everyone would go on it all the time.

JS

Not just a science one.

CH

Yes.

AN

Yes, that's true.

CH

If it had stuff on there that we could access like, you know, not just information but teaching activities or things you could do in the classroom.

AN

It does doesn't it?

CH

It only has a bit of science stuff.

JS

That's what I did for my wiki that I created, was try to do that.

Facilitator

You can make that wiki.

CH

So that's one thing that you could do.

Facilitator

Thank you. Hopefully your experience with the wiki, you will continue to use it?

AN

Yes, probably.

CH

One day. I'd use it, but...

Facilitator

If you play a bit more you get to know more. One thing that is not a benefit to using the wiki is to co-author something. To edit, to work on co-writing. Because when you write something and your friend can see and do editing. Obviously you need to edit each other's work and how that works, you need to work it out so that you don't actually get upset with each other when somebody edits your work. But that's an example.

Thank you. Thank you very much for your input.

Interview KW & JT

Facilitator

Let's start. So it's about the use of Wiki, that you were using in the unit. You're collaborating as a pair - two people per group?

KW

Oh, ours was a bit more...

Facilitator

A bit more.

KW

...because people came and went.

JT

Yeah, I had two. Then I had one person join in the next semester or something like that.

Facilitator

Oh, in the next semester.

JT

So we have eventually three, but yeah, it started with two.

KW

Because it started last year and carried over, some of the groups changed.

Facilitator

So how many groups?

KW

In our group, there were probably four.

Facilitator

Four, okay.

JT

There were quite a few groups as well, because everyone had to do the [tap]. All the fourth year students had to be in a group. I know some weren't, because they asked what's a Wiki. [Laughs]. But I know most of the fourth year education students did Wiki with Cathy.

Facilitator

Can you state your name?

KW

KW Williamson.

JT

JT [Tay]:

Facilitator

Thank you. So the work in your project started with a few people and then some joined up later on?

KW

Yeah, because it started at the end of last year...

JT

Yeah.

KW

...in 291...

JT

Yeah, [tap 291].

KW

...and then carried over this year.

Facilitator

So you had a new member. Did you lose any member before from the first one?

KW

From my group, no. But there were other groups that lost members and it ended it up being one person, so they joined our group.

Facilitator

Oh, okay. So for the one this semester, how did the collaboration work?

JT

I didn't do too much. We weren't expected to do anything this semester with it, except I think, just comment on the work that was done last semester. So there was not too much done at all.

KW

No, we didn't do too much. I added another section on ours just because I found it interesting. So I added another section.

JT

Yeah, actually I did that as well, and I just touched up the...

KW

Typos. [Laughs]. I corrected some typos I think.

JT

Yeah. We actually had a very nice list of what we planned to do for [unclear] and we had all the links to each thing and we wanted to expand on it, on that Wiki. But time wise we only were able to do an introduction, what [unclear] - where are they. But we missed out about six, seven other points. So I tried to type up a little bit more just to beef it up a little. But there wasn't too much more I could do. We didn't get instructed at all to finish Wiki's, to make them...

KW

Not that you want to add another assessment task, but if it was assessed, then it probably would have been better done. Like some of them were really good and others of them...

JT

They just wrote a few sentences and...

KW

[Laughs].

JT

...that was about it.

KW

Yeah, were a bit scarce. I think part of that is because it continued over from one year to the next. But if it was assessed, than you might have got a more consistent quality of work through it. Because some groups took it more seriously than others I think.

JT

Yeah.

Facilitator

So throughout the semester last year, was it? [Unclear] So, how did you work with your team mates in making the Wiki?

KW

Mostly it was in Cathy's - we started in Cathy's workshops last year and then individually we just added to it from home really.

JT

That's right. The collaboration - we only got an hour...

KW

Two workshops, or three workshops I think

JT

...or maybe two hours, yeah, but only two or three times where we actually saw people face to face. But I think the task was explained pretty well. It wasn't a difficult task, so we were able to go home and work on it and add stuff. That meant that we had to trust that the other person was going to add their share of things. But with Wikis you know you can always check that, so it wasn't too difficult to collaborate. But I'm not sure how much collaboration there was. Everyone just did their own thing when they went home to work on it.

Facilitator

Did you divide the work? How did you plan?

JT

Well me and Michael, we planned to divide our work, but I think he ended up doing more of it because - yeah, I did more of the structure of the page and he got the content and just pasted it on, and I edited it. So in saying that, we did collaborate in roles, but maybe not in fairness of tasks.

KW

Yeah I found that at this level, the collaboration's just a natural thing. You pick the people in your group pretty carefully - normally if it's group work. So you already know them and you already have a rapport. It's not like you're working with a stranger and then - it's the type of faculty, I think, where you just do what needs to be done.

JT

Yep. Everyone has the thing about them - we just do what the teacher's ask. No one's really going to slack off or go off task.

Facilitator

So everybody added the pages, contributing their own part?

JT

Yep. That's what happened with us.

KW

Yeah. Any of us would edit the entire thing. I wasn't only going to edit my part, or Penny wasn't only going to edit her part. You just go in there and you do what needed to be done.

JT

Yep.

Facilitator

So was it difficult to do - to use?

KW

I found it finicky more than anything else.

JT

My friend described it best. I introduced it to a friend later on, and he said, oh, this is basically Microsoft Word, but you can organise all your stuff. So the Wiki pretty much is like Microsoft Word, but you can do more with it. It's more about the collaboration side of things. So I agree, it's sort of finicky, but...

KW

It is finicky.

JT

... I think it's very well - it categorises things very well into pages and files and...

KW

Oh, that part I love.

JT

...so that part's good. It's just some things...

KW

It's just like trying to paste in a picture or something, you have to put it onto a clipboard, save it as a picture file and then add it in. You can't just copy and paste and things. So it's more like...

JT

We used to work around the hyperlinks as well and all that kind of stuff.

KW

Yeah, something [unclear]...

JT

Then linking pages to other pages is a bit tricky for some of the people. But I think once you've got it, you've got. If you don't, you've just got to work towards getting it, and I don't have - I don't get half the stuff. It wasn't too difficult I don't think. To do what we were expected to do...

KW

No, no it wasn't.

JT

...it wasn't too difficult at all.

KW

No, it's just you have to figure it out. There's no, if you want to do this, this is how to do it.

JT

Yep. You can't just get a [unclear] person, who can just come up and...

KW

You need technical support.

JT

You do need a bit of technical support, whether it's from your peers or the teacher. You do need someone who knows what they're doing to just give you a bit of push in the right direction.

Facilitator

But from a non technical aspect, when you have to collaborate together these Wiki pages, you can edit each other's - would that work fine, or would people find it quite [unclear]...

JT

Was that for other classes?

Facilitator

No, for your own group.

JT

Oh, for our own group. We only had one page. [Laughs]. All the information went onto one page.

KW

Yeah, ours was all on one page too. With links to external sites and stuff.

JT

Yeah, that's right. That's what we had, links as well. I think at that stage, we didn't know how to create more pages and link them. Or maybe the instruction was only create one page.

KW

Oh, I think we did have one page that linked. But yeah...

JT

We didn't do multiple pages.

KW

I think with the time thing - because there wasn't - we had the time in a couple of workshops last year, and we did the experiments...

JT

Yeah, that's right.

KW

...and you're supposed to add that.

JT

That's right.

KW

This year, because we were reviewing, you and I took the opportunity to go in and add a little bit more.

JT

Make it look a little bit more professional.

KW

Yeah, but it's just a time thing. Like I said, that's why it would be good if it was an assessed task...

JT

Definitely.

KW

...because then you have to put the time to it. Whereas you have to prioritise what's assessed and what's not unfortunately. You do the best you can, but...

Facilitator

So if multiple people are editing a single page, how do you work out any issues in working out how to work it?

JT

I think if you don't trust your person, or if they've done something that you know is wrong - I think everyone was on the same level. Everyone was administrator - administrative powers. So you could change and you could be really silly and type in ridiculous things if you wanted to, but I think most people were sensible about it and diligent with their work.

But you could always check the - this is something that Cathy did tell us before, because I was worried about that. What happens if I accidently delete something or whatever, and it saves? Or I save it and then I realise that I deleted it, what am I going to do? Because it might have been someone else's work I just deleted. She told us about the history. We've only got the free version of the Wiki, which doesn't let you save to your hard drive the pages, it's only saved on the Internet.

But you can recover certain - but you can go back in your history and recover the pages that were saved however many times before. So you can see what other people did and what was changed up to that point. But that's if you really could be bothered.

KW

Yeah. Well I think it's different in that, with Wikipedia, that's a huge collaboration of people all over the world. Whereas here, you're working with somebody that you see at least twice a week at lectures and so, you know there's a relationship there and you know them. If there was an issue and you wanted to go about something differently, then you'd just talk about it. Not that it came up that way, but if there was, then you'd just talk about it. Make a decision jointly. I don't think that there were too many issues like that.

JT

Maybe if you're getting at what happens if we don't have face to face contact and we do use Wiki's, then I do foresee some problems there. You'd have to use the comment section I think below. You know how there's a comment section...

KW

Yeah, there is.

JT

...as well. So before you edit someone else's work, maybe - if I was working in someone in Queensland or something like that on a Wiki page, then I would actually politely comment and say, should we change this, this, this, this. Is this right? They can comment back as well. I'd expect them to not change anything I've done unless they've told me, look, this might be a better way of writing it or, what do you think about this. Then we can go and change it. Because I feel like the page is the official thing and the comments could help the collaboration process. Either that or create another page where you can just...

KW

Or email. You'd probably...

JT

Email, or email, yeah.

KW

...just email. Because otherwise the comments, it's all there for - I don't know if you can delete comments...

JT

Yeah, yeah, yeah. You can delete them.

KW

...you know what I mean. It's all there for anybody who looks at the page.

JT

Yeah, no. That's true.

KW

So you'd probably just email. But because we all knew each other and knew where to find each other...

JT

So yeah, you need communication if you want to change - I think it's polite to have communication when you change things collaborative wise.

Facilitator

Do you use the comment functions in the Wiki?

KW

Yeah, Cathy made us.

JT

Made us.

KW

[Laughs].

JT

[Laughs].

KW

I was going to say it differently, but yes, basically.

JT

It was a...

KW

It was the first tutorial this term.

JT

Then also last time, once the Wiki pages were first made, she asked us to comment on other people's work. Find two other groups or something like that and comment on their work.

KW

This was really good, because it made you investigate everything that was on there, as opposed to just doing your part.

JT

Yeah.

KW

So it really made you see how valuable some of the pages are.

JT

You must have looked at more pages than I did.

KW

Some of them are good.

JT

I only looked at a few.

KW

Some of them are good.

JT

I think I only looked at three or four.

KW

I don't know. I found it addictive. Once I started I'm like, I wonder about that one. Oh, not so good, I'll go find another one. Oh, I like that one. So yeah, it was a bit addictive.

Facilitator

Did you go through the whole Wiki?

KW

Oh not the whole one. But the topics that I found interesting I took a quick look at.

Facilitator

Did you comment on it?

KW

Yeah, not all the time - but a good part of the time yeah.

JT

If I saw something I liked, I commented on it. That's pretty much it. I just commented on - give them encouragement or said, oh that's well done. Other than that, I really didn't even look through half the stuff, because like you said, assessment, we had exams and assessments and this was towards the back end of the semester I do believe, or maybe through the midway part, so we did have exams coming up and I just didn't have time, or the motivation actually to just go and look through everyone's Wiki. It wasn't assessed so, hence the motivation factor was zero.

KW

I know but it's called procrastinating. See you can procrastinate doing other work...

JT

That's what Facebook's for.

KW

...if you playing on the Wiki JT.

Facilitator

Put it to better use - productive use.

JT

Productive procrastination.

KW

You should check out - I've got a - I haven't told too many people, I should tell more. I've put a Facebook group Mac Primary Teachers 2010...

JT

Helena?

KW

...and Penny and I have put links and stuff up...

JT

Ah, because Helena's got one.

KW

...like just for resources.

JT

Right.

KW

So yeah, Penny and I are doing it just for resources so that...

JT

Oh just for resources. Yeah, sure.

KW

As opposed to...

JT

That was just...

KW

[Unclear] and stuff like that.

JT

Yeah, yeah. Helena's one was just getting all the final year grads for 2010, so that they know what's going on.

KW

Yeah, no, ours is like resource based. So it's all a bunch of links and stuff if you want to check it out. We've put some good links up there.

Facilitator

So what, did you set up something like in Facebook?

KW

Yeah,

Facilitator

Oh, that's interesting.

KW

Jut because I found the Wiki a bit fiddley. Wiki's probably a better way to go, but...

JT

I think Wiki's - it's just more formal as well. So when you're doing assignments and you're doing group work, you don't Facebook, you use Wiki because it's got the Word function.

KW

Yeah, and you can organise the information better.

JT

It's much more [unclear]...

KW

But because it's a bit fiddley and it would take time. Whereas Facebook, you can just whack it up.

JT

Yeah, I don't think use Wikis to communicate. You use Wikis to present and collaborate. But I think you use other means like email and social networking like Facebook to do the communication, the day to day communications. Wiki's like the final product. That's your spreadsheet of all the stuff you want to do.

Facilitator

So from your experience in using - is that the first time you've used the Wiki?

KW

Yeah, it was.

JT

Yep, yep. The first time [unclear] and I used it a lot after because I did a group assignment. I actually said hey guys, give me your email addresses, I'll give you this good site and we can share our notes together. It worked for two of the study - I created two study groups that semester using the Wiki.

KW

Oh you're good.

JT

It was just so I could leech - study off other people. But I also did share, so it worked really well. But no, I hadn't seen the Wiki before.

Facilitator

Okay. So how did you use that? Is it valuable to use the Wiki in those situations?

JT

Yeah, I think I chose the people correctly though.

KW

That's the key.

JT

That's the thing, that's the key - choosing the people who actually do their share of the work. If you choose people who don't do their work, then it's kind of slack to kick them off the Wiki, but I think I would have if they didn't - we only had a group of about four or five for one of them, and then three for the other. It was very basic.

We just used pages. We didn't put any links or anything like that. We literally just put up notes. So I told them, as you write your study notes, you might as well just write them up on the Wiki straight away, instead of having to write and then copy it or paste it or whatever. Then they told me that you could write a Word document and actually paste it onto the Wiki. Which obviously makes sense because you can copy, paste. But you could also paste a Word document there or something like that. So it worked well for what we needed to do. We used it.

KW

Can you attach?

JT

Yeah, you can...

KW

Can you attach to the Wiki? Can you attach a document?

JT

Yeah, you can attach a lot of stuff. That's what I found out. Not that I've been using that function, but...

KW

That'd be good.

JT

So in the Wiki that you were using, did you put pictures, images, video, YouTube, or something? What media? Or just text?

KW

In the science one we put...

JT

In the science one or the study group one?

Facilitator

In the science one.

JT

Science one. Yeah, we put pictures.

KW

We put pictures. We didn't put video. But there was a couple of them that did link to YouTube videos. The [Gack] one did.

JT

There's one - I know you can embed YouTube videos into it. I know you can, but just really...

KW

The [Gack] group did. You should look at that, it was - it didn't have a lot of information, but it's a really cool video.

JT

Okay.

KW

So cool. I didn't even know what [Gack] was before I looked at it.

JT

We've got pictures and we had links - two pictures and links to other websites, but no videos either. I do know how to do it now, because we had to use Wiki's in another education unit that I chose to do. It was a computers in school run by Matt [Bower] and he goes through a lot of the IT in schools and he did get us to do Wiki. So when that did come up, I could help other people. I did learn a few things as well, like how to do the hyperlink and page links and all that kind of stuff, and embed videos and whatnot.

That's the other thing, Wikis can be used as a blog as well - an alternative to a blog site. You could just create your own page, write your stuff, and then it's like an internal, or intranet blog. Where whoever you want to see the blog, can see it. You can make it a closed thing. I'm doing that at the moment with one of my friends. So we just share our ideas and stuff. It's only us that can see it. So we blog to each other and it's helpful that way.

Facilitator

That's a very interesting use.

KW

That would be cool to do in the classroom. With stage three kids. But you need your own class. You can't do it on prac.

Facilitator

So what do you see the value of the Wiki from all your experience [unclear]?

KW

Oh look I think it's very good for sharing information in a really organised way so that...

JT

There's a record kept of it as well. It would be awesome if you could have the higher level Wikis, which were free - the ones that give you more abilities like saving your work and backing it up. Because once - if your computer crashes or whatever, goodbye Wiki that were working on just then. Something to do with saving changes at certain points as well, so that you can revert back to the old whatever.

KW

Yeah, I would like to use it in the classroom...

JT

I think I would.

KW

...because I think the whole technology for these kids is so much easier than it is for us, and they see the value of it and it's just getting them to use it in an educational way as opposed to gaming or social way. So I think Wiki has a lot of value in that respect.

JT

I've not actually done any extra research about sites like the Wiki. I'm pretty sure there are a lot of sites out there that do the same thing as the Wiki. [Not sure whether they're as popular]. I don't know in terms of value, how it compares to other things. We might find a system that works even better than the Wiki. If we do, I think I'd go check it out.

But being familiar with the Wiki now, knowing it's limitations and what you can and can't do with it, I'd stick with that until I found something that was even better. Definitely use it in the classroom if I had a higher stage class. I wouldn't use it as some people have suggested for even Year 1, Year 2, Year 3, because they wouldn't really understand the variety of things you can do on it.

KW

Also their typing skills are...

JT

Yeah, and their typing skills.

KW

Take so long.

JT

So Year 5, Year 6. I think it's very useful for high school, definitely.

KW

Yeah, I think so.

JT

High school, uni is where it's targeted to. So I'd try to do it to the five, sixes. Maybe set an assignment and give them the ability to...

KW

Submit...

JT

...submit via...

KW

...on Wiki.

JT

...Wiki.

Facilitator

So what do you - if you have an idea of using the Wiki in the classrooms, what kind of challenges would you possibly...

KW

The biggest challenge is a lot of classrooms don't have a lot of computers.

JT

Yeah. Fighting for computer time at school would be an interesting thing.

KW

Because it's fiddley and there are so few computers, it's not like they're on it a lot that they would figure it out. So you're going to have to go over it. You'll have to do up a quick, if you want to do this cheat sheet - this is how you do it. If you want to do this, this is how you do it. So that they can do it on their own.

JT

Either that or I was just thinking, maybe if you had the luxury of dedicating it a few lessons prior to when you want them to use it for an assignment, maybe at the start of the year, get them - maybe, I don't know, group work. I'm just thinking if I had my own Year 6 class, first week at school, maybe book the computer rooms, and give them something fun to do. Teach them how to use a Wiki, get them in groups, working with each other, making new friends.

KW

You could even start out with them doing a page by themselves. Whatever they want to put on it. That way there's no research involved.

JT

No research. I would do a total introduction lesson - no research. Get them to write things up. Comment on each other's things. Make them familiar with the tools, and then we can use that for assignments. But that's again if you have luxury to do that.

KW

Yeah, and the other thing I think is, it's too easy for these kids to just copy and paste. They go onto the web, and they copy and they paste, and they copy and paste and they think that that's acceptable.

JT

How do we regulate that?

KW

It happens with PowerPoint - it happens if you have them do a PowerPoint presentation. Any time they're doing something electronic. In our day you had to get the book, and you had to change it into your own words because it was much easier than typing out everything straight from the book. So I think you have to do a lot of work with kids on plagiarism and putting things into their own words and acknowledging sources - because they're not very good with that.

JT

Yeah, teaching source recognition. Because I remember primary school, we didn't even know what plagiarising was. You literally just copied, paste. Someone said, hey you can do control C...

KW

Yeah, C.

JT

...and control V, and we're like, oh wow.

KW

Yeah, I went to a primary school when there were no computers. That's the difference, because kids these days, they just copy and paste.

JT

So that would be one, monitoring how much plagiarised work gets done on the Wiki. I guess you could overcome that, if you were the admin, the teacher was the admin and the students only had writing privileges, you could still butt into everyone's page, and comment. If you see that they've put in this really nice article or something like that and which you know they couldn't have written up, you write or you go in there, and you use the drawing tool or whatever, you circle, or you're like, this is not your work, change it to your own words. So then they open their Wiki page the next day and they're like, oh, mm.

Facilitator

I like it.

JT

Or maybe you just highlight. You use the highlight tool and just highlight everything that you thought, right, this needs to changed and then you write a comment at the bottom - change everything that's highlighted. I guess you could, but that's a lot of work on your part as a teacher.

KW

I think you have to just teach them up front. Because it doubles your work and it doubles theirs.

JT

Other than that, I don't really see too many limitations, because the Wiki can do everything I think you need it do in the classroom in terms of collaboration and assignments and activities.

KW

No, it would be good to - once we all go out, it'd we be good to do a Wiki across different schools - you know they have the books wraps and everything, through the [DT]. But you could do two stage three teachers could do a Wiki, and both classes could contribute across schools. I think it's good to use in your class, but they're still face to face, but if you do it across schools and there's a joint collaboration, then...

Facilitator

[Unclear]

KW

Yeah. I think that would be really good.

JT

I mean, I know there are a lot of sites - someone on Facebook gave me this site where the teacher blogs and the blog has links to all these resources and everything. The teacher's going up for a blogging award apparently. This site that she's got, the master teacher's got, is just fantastic. There's resources everywhere links to stage activities and everything. A lot of teachers have signed up to the blog and they all comment and make comments as well.

KW

You have to send me that one. Put it on blackboard.

JT

Yeah [Catherine Thompson] sent out this massive email saying oh - I'll see whether I can get it.

KW

Can you put it on blackboard?

JT

I don't have the - I didn't save the link, I only looked at it. So I'll get [Catherine] to put it on blackboard. But you could use a Wiki to do this same sort of thing. I guess where you have - if you leave it open, you can title it in a certain way that would catch the search engines thing when people look for resources or teaching resources. You could do the same thing. I want a stage one, stage two, stage three. Then you divide that even more into your topics, and then you can divide that into different schools. It's a good way to organise - as we've been saying the whole time - it's just a good way to get organised and you can expand it out to different schools as well, that's a good idea.

KW

I found a really good phys-ed website. This guy in America - it's amazing. Also it's a collaborative [unclear].

Facilitator

So are you going to try any of that in your...

KW

Like there're all these things you'd like to do...

JT

Yep.

KW

...but it's a case of time...

JT

Yep.

KW

...I think.

JT

Your priorities as well. If you're not doing too much group work because you have a class that - you need to focus on classroom management more than anything else, you wouldn't be doing too much assignment group work, or you may not be doing enough assignment group work and again, I would only use the Wiki if I had a Year 5 or 6 class, or an advanced Year 5 or 6 class. I wouldn't waste my time, really doing it with a stage one or stage two class. But yeah, if the need arose for collaborative work, I wouldn't get them to sit there and write in their books or email to each other the whole time, because it's really fidgety to email your work and get someone else to check or collaborate it. So definitely the Wiki is best for doing the online sharing things. But you've also got to realise with the SES region that you're in, if they are the lower end of the SES, like out near Mount Druitt, which is where I'm teaching...

KW

Yeah, me too.

JT

...a lot of students won't have access to the Internet...

KW

No you have to do it at school.

JT

...or good Internet. Our school doesn't have a computer room anymore, because it was an OH & S thing apparently. There was something about wires and whatnot, so they killed the whole computer classroom, and put most of the computers in the library. But still there's not enough for the whole class to work on at the same time. So we just have by passed using computers unfortunately.

KW

[Unclear] interactive whiteboard.

JT

We've got an interactive whiteboard.

KW

Oh do you. We don't. We've got chalkboard and four computers to share between two classes.

JT

I hate chalk boards.

KW

It is what it is.

Facilitator

Thank you. Good feedback from you.

KW

Well good luck.

JT

No worries. Yeah, good luck with what you're doing.

KW

If you find a way to make it easier, then let us know.

Facilitator

[Laughs].

JT

So are you just focusing on your...

Interview RS & BM

Facilitator

So, it's just about the use of wiki that you did at uni. So just a couple of questions - first of all is, what's your name?

RS

RS.

Facilitator

RS, and?

BM

BM.

Facilitator

Are you in the same group?

RS & BM

Yeah.

Facilitator

It was a group assignment was it?

BM

Well we weren't in the same group

RS

No, no, not for the wiki.

Facilitator

So, how was the collaboration in that group - each of your own group? How is that happening?

RS

With my group - because it was about two people per group - I found I was doing a lot of the work and my partner wasn't doing nearly as much. He was typing, but yeah, so collaboration-wise - it depends who you work with, I'm guessing, whether you both want to put in as much effort.

BM

Yeah, I actually was only with another person in my group and we always work together if we can on group assignments, I guess because we both have really similar sort of outlooks on where we want to be with our assignments and the mark we want to get. We usually both put in an enormous amount of work for it. So I guess the collaboration was fairly even, because it's with two people only, I think it was a lot easier, definitely. I think when there's a third wheel on assignments, that's when you have problems, because in a previous assignment, as soon as there's a third person, we still ended up doing most of the work because it was easier, yes.

Facilitator

So when you're working together - I'm not quite sure of the situation, but when you're working together. Were you taking different roles or were you just taking turns using the wiki or - how was it done?

BM

How did we do it? We...

RS

My partner didn't have a login until the other day, so we were accessing it from mine all the time.

Facilitator

So you would be the one that's actually putting stuff on the wiki.

RS

Yeah.

BM

We kind of just - to start with I think we just took it in turns because - like I guess I found it helpful because it was on the wiki, so I could see what my partner had done, and we kind of to start with didn't - I don't think we really discussed what either was going to do. We kind of looked at the assignment questions, and it was, you know, design a wiki and put so much information up there. So I think, because of that, I just saw what she had done and I added to it without initially really talking to her. Because I don't think she was there the first day of the wiki assignment was handed out, so she was just doing it from home. Yeah, so just for starting.

Facilitator

So both of you edit to wiki…

BM

Yeah, we just added, like I saw what she'd done and she'd just started putting information - because ours was on volcanoes, and I just researched some more and added to what she'd already done.

Facilitator

So, do you find it difficult?

BM

Using? No, it was very easy. I'd never used one before, but no, I never even really looked at a wiki before.

RS

It's good though, because you can see what everyone else has done and go and comment on it, and…

Facilitator

Probably looked at Wikipedia before?

BM

Yeah, that's true. Yeah, Wikipedia. I never associate that…

Facilitator

Massive one, but still.

BM

I guess I don't think of it like that.

RS

It's a lot more - it's a more social sort of way of adding information, I would say, because you can comment on everyone's…

BM

That's stuff that's not just a published paper that you can't do anything to.

RS

Yes, it was good I guess, because you could see what everyone else had done, because then if you thought you needed to add more, or you hadn't done enough work, you can just see oh, they've set it out like that.

Facilitator

So for you when you started first, because you didn't actually talk it over with your...

BM

Yes.

Facilitator

...group mates, you just happened to use it. Is that - find it difficult? Are things not working?

BM

Not really, I found it quite an easy thing to use, and it was all there, because I find sometimes with group work, if you don't meet for a week or something, you're waiting to find what your group member has or hasn't done. But, I guess in that sense, it's right there and it was very easy to know if they had done anything or not.

Facilitator

But you don't actually meet to discuss [unclear] before you put stuff - you just go onto the wiki...

BM

No, we just went for it, yeah.

RS

It's good, the technology's easy to use so it's not like you have to use HTML code or, you don't have to be versed in technical sort of stuff to use it.

BM

No, exactly, it was easy like that, yeah.

Facilitator

It worked for you because your teammates didn't interact much with the wiki, so how was the collaboration side?

RS

Oh yeah, no we actually were very good friends - just didn't put in as much work. No, but he's good with the - say we ended up having to make a deal. Okay, well you can do the typing, because he's a fast typer, and I'll do the research part of it, so it was more function and research than, yeah. But also, too, he lost his - he couldn't remember his wiki password so he couldn't log in. So if he wanted to log in he'd have to talk to me and do it on mine, and yeah.

Facilitator

So you're editing the wiki together in front of the computer?

RS

Yeah.

Facilitator

You're editing it together.

RS

Yep.

Facilitator

Did you use other tools to help you to collaborate?

RS

Well, done assignments before - MSN and Facebook and what's the other ones? Maybe not MySpace, we weren't really - it died out in the first year of uni. Just, I guess, text messaging, as well.

BM

Yeah, I guess for me, e-mail. E-mail was the biggest one for us. Not really any of these chatting sites or anything, I can't be bothered.

RS

You could use Skype, as well, but it depends whether everyone's got a microphone and - so there are some restrictions with whether you have all the bits and pieces.

Facilitator

So the wiki itself is quite easy to use?

BM/RS

Yes.

Facilitator

Do you have a special tutorial time? I think it [unclear] tutorial time?

RS

Yeah.

Facilitator

Tell you how to use the wiki, that's the first time you...

RS

Yeah, that was the first time we'd used this one. Funnily enough, I think the partner I did it with had actually made a wiki before. They made it about someone at school, and it quickly got taken off.

Facilitator

So what features of the wiki - did you find it useful or, in terms of doing your tasks.

RS

Well, being able to easily copy things into it like pictures...

BM

Yeah, I was thinking that, actually.

RS

...and there's no sort of restriction, but just - I don't know, it's very user-friendly. There's lots of good navigational tools all down the side panel and you can comment and rate and it's all very - a lot of it's self-explanatory. You know, you wouldn't have to go in depth on - if you got stuck somewhere, well you wouldn't get stuck.

Facilitator

Did you use the commenting?

RS

Yes.

Facilitator

How did you use it?

BM

Well we've kind of had to use it, I guess, even this year and last year, I think, as well.

RS

Yeah, well Kathy got us to do it.

BM

Yeah, Kathy wanted us to utilise it.

Facilitator

Commenting other people's work?

RS

Yes.

BM

Yeah, so we had to comment on other groups and just give feedback about things last year, and then this year, Kathy wanted us to last week or the week before review our own work from last week, last year, as well.

RS

Some people use it effectively and some people just go, it was great, yeah. They don't use it like feedback, they use it as, oh quick I've got to get this over and done with because Kathy set it as homework. You know, if you actually sit down and use it then at least the people can change it a bit if they feel the comments are valid.

BM

Yes, because she had criteria we were meant to review it by, but most people didn't do that. It was great, I loved it. Great pictures.

Facilitator

What about in your own image, because you're working not on the same location at the same, do you comment in each other's contributions?

RS

No, not really.

BM

No, oh my friend said I did a good job.

RS

On the comment box or...

BM

No, no, no, actually she should, shouldn't she? No, because I managed to put extra graphics on ours to make it look prettier, and managed to put these animation-y type things for the volcanoes on there, so she really liked that.

Facilitator

Did you - was it like compiling a list of researchers, was it?

BM

Yes.

RS

Yeah, at the end of it.

BM

Yes, we had to pick a subject, like a science subject and then research it and put the info up and do an investigation based on it that could be replicated in a classroom.

Facilitator

In the process of working together, did you aid other people's work or delete your mate's contributions?

RS

No.

BM

No, I didn't actually, no.

RS

That never came up.

BM

No, so it's on there, I won't touch it.

RS

It's all relatively appropriate, but we would never actually, you know, Kathy never said to us delete something, unless we were told we didn't really go there.

Facilitator

But you can edit each other's work?

BM

Oh yeah, absolutely, you could delete it all if you wanted to.

RS

You'd make enemies pretty quick.

Facilitator

So, after you have experienced using the wiki to collaborate, to work together in this project, what would you think wiki can also be used - other situation of collaboration or kind of class things?

RS

Probably teachers working together on a wiki in a school…

BM

Yes.

RS

…which a lot of them don't seem to do. I know there's the government - they've set up the blog spaces, but I've only been - I mean, I've only been with two schools, but I know the schools that just then didn't use it. But the school before, there was one guy on staff who was, we've got to start using it, we've got to. Give me your pictures and I'll put it up. Flying the banner, yeah.

But a lot of teachers aren't into technology - that's probably why they push it so much here at Macquarie because it's - we are in a technology age and a lot of older teachers don't know about it, or like one of my teacher's attitudes was which, oh well they've only got one training day on the interactive whiteboard and it's right at the end of the semester so no one's going to go, and I can't be bothered in my spare time learning about it. I thought, well that's how we learn about it, we go home, we download the program and we play with it, yeah.

Facilitator

So how would you think teachers can benefit using the wiki?

BM

It's a time-saver, I guess.

RS

Sharing resources, so they can just go to it, print them off if they need them and - I wouldn't know whether you'd use it for recording, like just in case other people can access it, unless there's some setting to make it a private thing amongst certain people. You know like, reporting student results and things like that, you wouldn't do that. In some cases, someone clever can hack into it and, yeah.

Facilitator

Do you see wiki as a useful means to communicate?

RS

Well, to communicate information more so, more factual.

BM

Yeah, information, not really just communicating, talking.

RS

No, you'd Facebook and Twitter - I don't use Twitter, but things like that, for more social aspects of communication.

Facilitator

Because there's only two groups there wasn't much need - two persons in the group, there wasn't much need of communicating among the members - very easy to just meet up?

RS

Yeah.

BM

Yeah, that's it. I guess, if you get to talk to someone who had a bigger group, that's probably a bit more interesting than me, but yeah definitely to see how it played out then.

Facilitator

So if you supposedly had to do the same assignment that - or to do the same kind of project, but you had to do it manually as in, maybe just a word document. Would you see any difficulties compared to wiki?

RS

Well, you couldn't share it with everyone online, because there's no link to them. You'd have to turn it into a HTML page and give everyone your URL or whatever, whereas this is just a common ground sort of place.

Facilitator

In that sense wiki has been very useful in having that kind of place?

BM

Yeah, definitely, otherwise…

RS

Also, when it's in print, you can't link it to something.

BM

Yeah, exactly, I guess it's just time-saving because it's there and you don't have to - because when I've done previous assignments, I've had to e-mail my pages, and if they've got pictures that are too big and you can't do it - that's happened. So we've had to put on a USB and meet at uni and edit here. So that was a bit of a pain, so I can definitely see doing, if we'd done the same thing on the wiki, it would have been a lot easier.

Facilitator

So, yep I think we've covered most of it. So, you definitely enjoy using wiki?

BM

Yeah, I - well it depends who you're working with.

Facilitator

Would you actually use it for personal use?

BM

I don't know if I would to be honest. I can see it…

RS

Not in a social sense, because a lot of our spare time is used on computers is more social, but you would use it if you wanted to, I don't know, just put up information about something.

BM

Yeah, definitely, I can sort of see, because there's - when you're doing even teaching and that and you've got to search for all these resources and things and that takes so much time, and you have to sift through the Internet, all the junk.

RS

Plus, everyone goes to Wikipedia.

BM

So I think, yeah, definitely, putting it all - I'm sort of thinking eventually I'd like to set up something where I find all my resources and pool them all together and all the ones that I think are worthwhile, and just have them somewhere that everyone can get to it. Just a time-saver thing, because I find I spend so much time just looking for information, and if everyone could actually do that and review and have it up somewhere.

Facilitator

So you share anything among - in between groups, or the working together is just in the group.

BM

It was just in the group, yeah.

RS

Then we just showed each other what we did and practically, as well, we got our experiments running as if it was a classroom simulation. The only thing I ever wonder about all the online stuff is copyright laws, like when we do copy and paste the images, do we need to reference - where do we reference it, is referencing good enough, do we need to ask permission to use images and - information you can rewrite and whatnot, but images you can't exactly...

BM

Yeah, I guess that's good - probably...

Facilitator

You can't rephrase it.

BM

Yeah, probably I'm just a bit lazy with doing that, but I know in computer subjects from previous years, they were telling us you have to have some sort of reference for all your images.

RS

People take it very lightly, too. La, la, la, they're not going to chase me down - get a $1 million fine.

BM

Yeah, exactly. So that's a good point, anyway, that maybe more education and copyright laws and intellectual property and things like that.

Facilitator

Thank you.

RS

Thank you, it's good to finally meet you, I've heard so much about you.

Facilitator

Oh really? Hopefully good things.

This page is deliberately left blank.

17 Appendix I: Final Ethics Approval Letters

The research presented in this thesis was approved by Macquarie University Ethics Review Committee,

Title	Reference Number	Initial approval date
Investigating Web 2.0 affordances to support collaborative learning activities in Higher Education (Case 1: Computing Unit)	HE27FEB2009-D06280	05/02/2009
Investigating Web 2.0 affordances to support collaborative learning activities in Higher Education (Case 2: Education Unit)	HE27FEB2009-D06279	18/02/2009
Investigating Web 2.0 affordances to support collaborative learning activities in Higher Education (Case 3: Education Unit)	HE29MAY2009-D06616HS	17/06/2009
Investigating Web 2.0 affordances to support collaborative learning activities in Higher Education (Case 4: Education Unit)	HE26JUN2009-D06642HS	17/06/2009

17.1 Ethics Approval Case 1: Computing Unit

MACQUARIE UNIVERSITY

05 February 2009

Mr Andreas Utomo Kuswara
C3A, Department of Education
Faculty of Human Sciences
Macquarie University

Reference: HE27FEB2009-D06280

Dear Mr Kuswara

FINAL APPROVAL

Title of project: "Investigating Web 2.0 affordances to support collaborative learning activities in Higher Education (Case 1: Teaching Unit)"

Thank you for your recent correspondence. Your response has addressed the issues raised by the Ethics Review Committee (Human Research) and you may now commence your research.

Please note the following standard requirements of approval:

1. Approval will be for a period of twelve (12) months. At the end of this period, if the project has been completed, abandoned, discontinued or not commenced for any reason, you are required to submit a Final Report on the project. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. The Final Report is available at: http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms
2. However, at the end of the 12 month period if the project is still current you should instead submit an application for renewal of the approval if the project has run for less than five (5) years. This form is available at http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms 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 (see Point 1 above) 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).
3. Please remember the Committee must be notified of any alteration to the project.
4. You must 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.
5. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University http://www.research.mq.edu.au/researchers/ethics/human_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 Macquarie University's Research Grants Officer with a copy of this letter as soon as possible. The Research Grants Officer will not inform external funding agencies that you have final approval for your project and funds will not be released until the Research Grants Officer has received a copy of this final approval letter.

ETHICS REVIEW COMMITTEE (HUMAN RESEARCH)
LEVEL 3, RESEARCH HUB, BUILDING C5C
MACQUARIE UNIVERSITY
NSW, 2109 AUSTRALIA
Ethics Secretariat: Ph: (02) 9850 6848 Fax: (02) 9850 4465 E-mail: ethics.secretariat@vc.mq.edu.au
http://www.research.mq.edu.au/researchers/ethics/human_ethics

Yours sincerely

P. P. Dr Shirley Wyver
Acting Chair, Ethics Review Committee (Human Research)

Cc: Professor John Hedberg, Department of Education

17.2 Ethics Approval Case 2: Education Unit

MACQUARIE UNIVERSITY

Research Office
Research Hub, Building C5C East
MACQUARIE UNIVERSITY NSW 2109

Phone **+61 (0)2 9850 8612**
Fax +61 (0)2 9850 4465
Email ro@vc.mq.edu.au

18 February 2009

Mr Andreas Utomo Kuswara
C3A 915, Department of Education
Macquarie University

Dear Mr Kuswara

FINAL APPROVAL

Title of Project: 'Investigating Web 2.0 affordances to support collaborative learning activities in Higher Education (Case 2: Education Unit)'

Thank you for your recent correspondence. Your response has addressed the issues raised by the Ethics Review Committee (Human Research) and you may now commence your research.

Please note the following standard requirements of approval:

1. Approval will be for a period of twelve (12) months. At the end of this period, if the project has been completed, abandoned, discontinued or not commenced for any reason, you are required to submit a Final Report on the project. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. The Final Report is available at: http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms
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Please do not hesitate to contact the Ethics Secretariat by email on ethics.secretariat@vc.mq.edu.au or by telephone on 9850 6848 if we can be of further assistance.

www.mq.edu.au

Yours Sincerely

P. Thp

P. P. **Dr Shirley Wyver**
Acting Chair, Ethics Review Committee (Human Research)

Cc: Professor John Hedberg, Department of Education

17.3 Ethics Approval Case 3: Education Unit

MACQUARIE UNIVERSITY

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17 June 2009

Mr Andreas Kuswara
C3A 915
School of Education
Macquarie University
NSW 2109

Reference: HE29MAY2009-D06616HS

Dear Mr Kuswara,

Title of project: Investigating Web 2.0 affordances to support collaborative learning activities in Higher Education (Case 3: Education Unit)

Thank you for your recent correspondence. Your responses have addressed the issues raised by The Faculty of Human Sciences Sub-Committee of the Ethics Review Committee (Human Research). Approval of the above application is granted, effective 17th June 2009, and you may now proceed with your research.

STANDARD REQUIREMENTS ATTACHED TO APPROVAL:

1. Approval will be for a period of twelve (12) months. At the end of this period, if the project has been completed, abandoned, discontinued or not commenced for any reason, you are required to submit a Final Report on the project. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. The Final Report is available at: http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms

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3. Please remember the Sub-Committee must be notified of any alteration to the project.

4. You must notify the Sub-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.

5. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University http://www.research.mq.edu.au/researchers/ethics/human_ethics/policy.

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Yours sincerely

p.p.

Dr Shirley Wyver
Chair, FoHS Ethics Review Sub-Committee, Ethics Review Committee (Human Research)

Cc: Professor John Hedberg, School of Education
Dr Veronica Gosper, Teaching & Learning Centre

17.4 Ethics Approval Case 4: Education Unit

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17 June 2009

Mr Andreas Kuswara
C3A 915
School of Education
Macquarie University
NSW 2109

Reference: HE26JUN2009-D06642HS

Dear Mr Kuswara,

Title of project: Investigating Web 2.0 affordances to support collaborative learning activities in Higher Education (Case 4: Education Unit)

Thank you for your recent correspondence. Your responses have addressed the issues raised by The Faculty of Human Sciences Sub-Committee of the Ethics Review Committee (Human Research). Approval of the above application is granted, effective 17th June 2009, and you may now proceed with your research.

STANDARD REQUIREMENTS ATTACHED TO APPROVAL:

1. Approval will be for a period of twelve (12) months. At the end of this period, if the project has been completed, abandoned, discontinued or not commenced for any reason, you are required to submit a Final Report on the project. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. The Final Report is available at: http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms

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Yours sincerely

p.p.

Dr Shirley Wyver
Chair, FoHS Ethics Review Sub-Committee, Ethics Review Committee (Human Research)

Cc: Professor John Hedberg, School of Education
Dr Veronica Gosper, Teaching & Learning Centre