

Blended learning in physiotherapy education: Designing and evaluating a technology-integrated approach

Michael Rowe

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in the Department of Physiotherapy, University of the Western Cape



Supervisors:
Professor Jose Frantz

Professor Vivienne Bozalek

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Abstract

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M. Rowe

PhD thesis, Department of Physiotherapy, University of the Western Cape

Background: Practice knowledge exists as a complex relationship between questions and answers in a context of meaning that is often intuitive and hidden from the novice practitioner. Physiotherapy education, which aims to develop patterns of thinking, reflection and reasoning as part of practice knowledge, is often based on didactic teaching methods that emphasise the learning of facts without highlighting the relationships between them. In order to improve health outcomes for patients, clinical educators must consider redesigning the curriculum to take into account the changing and complex nature of physiotherapy education. There is some evidence that a blended approach to teaching and learning may facilitate the development of graduates who are more capable of reflection, reasoning and critical thinking, and who can adapt and respond to the complex clinical environment. The purpose of this study was to develop principles that could be used to guide the design of blended learning environments that aim to develop capability in undergraduate physiotherapy students.

Method: The study took place in a university physiotherapy department in the Western Cape in South Africa, among undergraduate students. Design research was used as a framework to guide the study, and included a range of research methods as part of that process. The problem was identified using a systematic review of the literature and a survey of students. The design of the blended intervention that aimed to address the problem was informed by a narrative review of theoretical frameworks, two pilot studies that evaluated different aspects of blended learning, and a Delphi study. This process led to the development of a set of design principles which were used to inform the blended intervention, which was implemented and evaluated during 2012.

Results: The final results showed that students had undergone a transformation in how

they thought about the process and practice of learning as part of physiotherapy education, demonstrating critical approaches towards knowledge, the profession and authority. These changes were brought about by changing teaching and learning practices that were informed by the design principles in the preliminary phases of the project. These principles emphasised the use of technology to interact, articulate understanding, build relationships, embrace complexity, encourage creativity, stimulate reflection, acknowledge emotion, enhance flexibility and immerse students in the learning space.

Discussion: While clinical education is a complex undertaking with many challenges, evidence presented in this study demonstrates that the development of clinical reasoning, critical thinking and reflection can be enhanced through the intentional use of technology as part of a blended approach to teaching and learning. The design principles offer clinical educators a framework upon which to construct learning environments where the affordances of technology can be mapped to the principles, which are based on a sound pedagogical foundation. In this way, the use of technology in the learning environment is constructed around principles that are informed by theory. However, clinical educators who are considering the integration of innovative strategies in the curriculum should be aware that students may initially be reluctant to engage in self-directed learning activities, and that resistance from colleagues may obstruct the process.

Conclusion: The development of clinical reasoning, critical thinking and reflection in undergraduate physiotherapy students may be enhanced through the intentional use of appropriate technology that aims to fundamentally change teaching and learning practices. Design research offers a practical approach to conducting research in clinical education, leading to the development of principles of learning that are based on theory.

November, 2012

Keywords

Physiotherapy

Clinical reasoning

Clinical education

Blended learning

Educational technology



Declaration

I declare that *Blended learning in physiotherapy education: Designing and evaluating a technology-integrated approach* is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Name: _____

Date: _____

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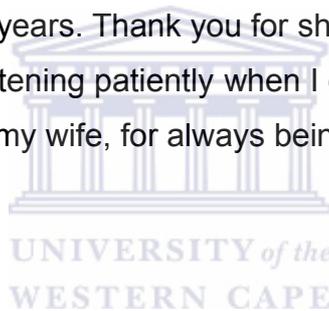


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Most importantly, thank you to my family and friends for their love, support and understanding over the past four years. Thank you for sharing in my excitement when things were going well, and for listening patiently when I complained that they were not. Finally, a big thank you to Astrid, my wife, for always being there and for understanding what this means to me.



Dedication

For Jeannine, my mother, who I miss very much.

For Albert, my father, who gave up so much for us.

And for Jacqueline, my sister, who has helped me more than she knows.



Publications and other output

The researcher has made use of the “PhD by publication” method in order to demonstrate an engaged approach to dissemination of the findings. This approach aims to make progressive contributions to the field during the course of the project, and strengthens the work by engaging in peer review as part of the publication process, as well as networking at conferences. Participating in an academic conversation via peer review also had the effect of increasing reflection during the process and strengthened the value of the research findings. This method therefore makes a more significant contribution to the field than the thesis alone.

This research project has resulted in the following research outputs:

Published articles

Rowe, M., Frantz, J. & Bozalek, V. (2012). The role of blended learning in clinical education: a systematic review. *Medical Teacher*, 34(4):e216-e221.

Rowe, M., Frantz, J. & Bozalek, V. (2012). Physiotherapy students’ use of emerging online technology as part of their learning practices. *South African Journal of Physiotherapy*, 68(1):29-34.

Rowe, M. (2012). The use of a wiki to facilitate collaborative learning in a South African physiotherapy department. *South African Journal of Physiotherapy*, 68(2):11-16.

Rowe, M. (2012). The use of assisted performance within a social network to develop reflective reasoning in undergraduate physiotherapy students. *Medical Teacher*, 34(7):e469-75.

Articles submitted and under review

Rowe, M., Frantz, J. & Bozalek, V. (2012). Beyond knowledge and skills: The use of a Delphi study to develop a technology-mediated teaching strategy. *BMC Medical Education*.

Rowe, M., Bozalek, V. & Frantz, J. (2012). A theoretical approach to technology-mediated teaching and learning in medical education. *Teaching and Learning in Medicine*.

Rowe, M., Bozalek, V. & Frantz, J. (2012). Using Google Drive to facilitate a blended approach to authentic learning. *British Journal of Educational Technology*.

Conference presentations

Rowe, M., Frantz, J. & Bozalek, V. (2011). Blended learning in clinical education: A systematic review. Poster presentation at the HELTASA conference, November, 2012, Stellenbosch University, Cape Town.

Rowe, M., Frantz, J. & Bozalek, V. (2011). Blended learning in clinical education: A systematic review. Oral presentation at the AMEE conference, August, 2011, Vienna, Austria.

Rowe, M. (2009). Collaborative knowledge construction using wikis. Oral presentation at the HELTASA conference, University of Johannesburg, November 2009.

Rowe, M. (2011). The use of a social network to facilitate the development of practice knowledge in undergraduate physiotherapy students. Oral presentation at the SAAHE conference, June 2011, North-West University, Potchefstroom.

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1. Chapter One: Background to the study

By confronting students with uncertainty, ambiguity, and conflicting perspectives, instructors help them develop more mature mental models that coincide with the problem-solving approaches used by experts. Authentic learning exercises expose the messiness of real-life decision making, where there may not be a right or a wrong answer.

Lombardi (2007, p. 10)

1.1. Clinical practice and clinical education

In 1910 Abraham Flexner published a report that led to an overhaul of the American medical education system and introduced a scientific approach to the curriculum, the impact of which is still evident today (Flexner, 1910; Frenk et al., 2010). Now, 102 years later, the medical education community is again faced with calls for sweeping reform to a system that is “inadequate to meet the needs of medicine” (Cooke, Irby, Sullivan, & Ludmerer, 2006, p.1343). As health systems become more complex and correspondingly place a heavier burden on healthcare workers, it is increasingly evident that clinical education has not kept pace, producing graduates who have difficulty coping with these challenges because of fragmented, outdated, and static curricula. While the science of medicine has changed significantly in the past few decades, the teaching of medicine has not (Graffam, 2007). Systematic problems include, among others, poor alignment between graduate competencies and patient needs, poor teamwork, distracted and over committed teachers, ossified curricular structures, archaic assessment practices and a focus on the technical aspects of knowledge and practice without an emphasis on contextual understanding (Cooke et al., 2006; Frenk et al., 2010).

There is a need for a redesign of medical education that takes into account the social, economic, and political aspects of health care delivery (Cooke et al., 2006). While it is challenging to teach these “messy” real-world issues, clinicians need to understand how

they affect patients and how to interact with, and ultimately improve, a complex and fragmented system in order to provide good patient care. Therefore, while students must gain mastery of large bodies of content, their final assessment will not be so much on what they know, but on what they do (Cooke et al., 2006). The modern medical expert is also not necessarily someone who knows all the facts, but rather is able to gain access to knowledge efficiently and when necessary, and who is able to form conceptual relationships between seemingly unrelated areas (Fraser & Greenhalgh, 2001). In other words, people who are educated in a field do not seek to simply reproduce what they have been trained to do. They change over time as a result of independent thinking, personal understanding, and justifying the choices they make within their field

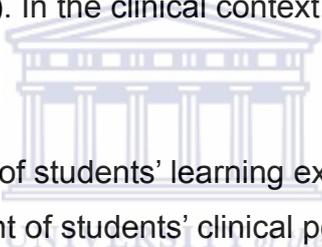
In order to improve the health outcomes for patients, clinical educators must consider redesigning professional teaching strategies by taking into account the changing and complex nature of education in the context of healthcare (Frenk et al., 2010). One of the major challenges in clinical education is that clinical practice is complex. Healthcare practitioners must constantly review and re-prioritise existing and new patient problems in an enterprise of active interpretation (Thornquist, 2001a, 2001b). They are constantly managing multiple changing variables that may be linked in a variety of ways to other changing variables. By constantly reviewing the patient's presentation as they move through the management process, the practitioner must constantly make decisions about how to proceed, taking into account the patient's current clinical presentation. Thus, practice knowledge exists as a relationship between questions and answers in a context of meaning that is often intuitive and hidden, especially from the novice practitioner (Higgs, Richardson, & Dahlgren, 2004). In order to successfully progress to independent clinical practice, educators try to develop in students a process of reasoning that will assist them in making the "right" choices.

One way in which clinical reasoning can be developed is through focused reflection, an important component of clinical practice and of lifelong learning (Dewey, 1933; Murphy, 2004; Schön, 1987). Reflection is a mental process with purpose, applied to relatively complicated, ill-structured problems for which there are no obvious solutions (Moon, 2001)

and which is difficult to assess (Boud & Walker, 1998). Reflection is a way that we can make sense of the world by interpreting facts and experiences through our own frames of reference (Higgs et al., 2004). Through this critical reflection on past experiences and the clinical decision-making process, the healthcare practitioner can develop an improved understanding of outcomes, and better prepare for future decisions in similar situations. In this way, both reflection and reasoning emphasise the connection between action and thinking (Aars, 2008).

1.2. Challenges within clinical education

Clinical education is often a challenge for educators, mainly because it is a part of the curriculum that they have much less control over, when compared with the more academic elements (Neville & French, 1991). In the clinical context, educators must be aware of, and try to control for:



inconsistency and inequity of students' learning experiences, lack of validity and reliability in assessment of students' clinical performance, varying standards of clinical teaching and levels of motivation among clinical educators, and lack of time and staff devoted to clinical education by clinical managers, have all been causes for concern. Central to this concern is the impact of such factors on learning outcomes and the overall quality of the clinical education experience

Cross (1995, p. 506)

Traditional clinical education is based on simplistic representations of discrete disciplines, often with an emphasis on facts that are taught without highlighting the relationships between them. But, learning how things are connected can be more useful than learning about the things themselves, and without an understanding of these interactions and relationships, it can be difficult to apply clinical facts in clinical contexts (Fraser & Greenhalgh, 2001). When knowledge and context are separated, knowledge is seen by learners as a product of education, rather than a tool to be used within dynamic, real-world

situations (Seely Brown, Collins, & Duguid, 1989). It is in this context that the trend in clinical education towards increased diversity, richness and authenticity in curriculum design in order to develop enhanced learning environments, can be better understood (Kalishman et al., 2001; Borrell-Carrio, Suchman, & Epstein, 2004).

One of the ways in which diversity, richness and authenticity in the curriculum could be introduced is in the sharing of knowledge and experiences from the clinical context, among students and teachers in a collegial community. This process enables external knowledge to be internalised, helps students to develop problem-solving strategies, promotes critical reflective thinking, and challenges unshared biases (Mason, 1998; Hanks, 1999). This process of discussion and sharing between those with experience and those without, exposes students early on to the culture (i.e. language and social norms of the domain) that influences the development of practice knowledge, by highlighting different ways of thinking and understanding about clinical problems. It was noted earlier that reflecting is a skill that is difficult to “teach”, but there are some strategies that clinical educators can use to assist students in developing in this area. For example, questions can be used to guide reflective activities. In this context, questions are not asked to elicit information, but to serve as a stimulus for the student to consider alternatives to what they have done or said. Finding time in the curriculum in which to develop the sustained discussions and level of communication necessary to develop reasoning and reflection, while difficult, is an important aspect of clinical education, as students who focus on communication may be better able to reason their way through clinical problems (Windish, Price, Clever, Magaziner, & Thomas, 2005).

While there is evidence that supports the use of learning theories derived in the social science literature, clinical teachers continue to use strategies that “knowingly fail to change behaviour” (Cohen, 2004, p. 2). In addition, clinical educators use teaching practices that aim to develop knowledge and skills, which in themselves are not problematic, as competent practice is essential. However, a focus on competence alone is inadequate to produce graduates who can adapt to the changing needs of health systems, and a new emphasis on capability requires cultural change among clinical educators (Fraser &

Greenhalgh, 2001). A purely technical approach to clinical education does not prepare students completely, as technical skills are only one part of the curriculum. Non-technical skills such as critical thinking, clinical reasoning and problem-solving are also essential aspects of professional development. However, these aspects of clinical practice are difficult to develop in the classroom context using didactic approaches that focus on teaching a simple set of knowledge and skills. We need teaching and learning practices that focus on the process of learning, rather than the product.

In order for healthcare students to develop the skills necessary to manage the challenges in clinical practice, we need to change teaching and learning strategies in the clinical context. However, clinical teachers still tend to emphasise knowledge and skills, and while these are certainly important essential aspects of clinical education, we must go beyond teaching students what to know and what to do (Fraser & Greenhalgh, 2001). We must help them learn *how to be*. We need to embrace a teaching approach that focuses on the process of learning rather than the memorisation of content. We need to create learning spaces where students can be introduced to, and immersed in, the culture of the profession, giving them the feeling of what it is like to be legitimate peripheral participants in a community of practice (Lombardi, 2007).

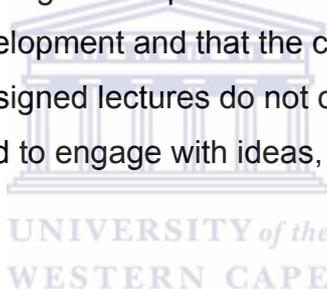
1.3. Pedagogical changes in higher education

Ramsden (2003) said that teaching should be about creating opportunities for student learning but often teachers take full responsibility for the learning process, as is demonstrated in the following quote:

I was struck by the irony that I did an enormous amount of reading and thinking about education in order to prepare my lectures, plan effective workshops and select readings and texts for my students, while the students did relatively little. I was the most active learner in my classes – because I had total responsibility for what was learned and how it was presented.

Hogan (1996, p. 79)

“Teaching is about moving minds” in order to develop independent thinkers who will not bend to the will of teachers (Laurillard, 2012, p. 5). Even though the past few decades have seen a change in our understanding of how learning in higher education takes place, we still see clinical educators focusing on the transmission of content in the form of a lecture as the preferred method of teaching (Graffam, 2007). While lectures in themselves are not inherently “bad” (they can range from being didactic to interactive), they should be used in an appropriate context, and to achieve appropriate objectives. One of the challenges with lectures is that the direction of information usually flows one way i.e. from lecturer to the class. Students are often not given adequate opportunities to articulate their thinking, which means that their misconceptions are not exposed, which makes it difficult for the teacher to address the errors in their understanding (Laurillard, 2002). This movement of ideas in one direction does not easily allow for the level of communication that we know is important for learning. It also presumes that all the students are at the same point in their academic development and that the content being delivered is equally relevant for all of them. Poorly designed lectures do not create authentic learning spaces because students are not required to engage with ideas, merely to passively “receive” them.



This is an important problem to consider, especially when viewed alongside Vygotsky's (1978) concept of the social construction of knowledge, mediated by a more knowledgeable other. In other words, learners need scaffolding and guidance to help them move from their current cognitive level to deeper understanding. The “gap” between what a student is able to achieve independently, and what they are able to achieve with guidance, is known as the Zone of Proximal Development (Vygotsky, 1978). The student needs to be guided through this zone by someone with more experience than they have (i.e. the more knowledgeable other), who can work with the student in a collaborative partnership to achieve deeper understanding. This social construction of knowledge is dependent on language and symbols as a means of communicating abstract ideas through discourse. Structured communication therefore enables learners to make conceptual leaps to higher cognitive levels, without which they would be unable to discern more abstract, academic knowledge (Laurillard, 2002). Communication and dialogue is therefore an

essential aspect of learning, as it provides the means by which learners can construct their own personally meaningful understanding of the world. It is therefore clear that contextual learning in which dialogue plays a major role is difficult to incorporate into didactic teaching methods like lectures, with their emphasis on the one way transmission of content (Herrington, 2006).

It is also common for teachers to make the assumption that learning which occurs in one context can easily be transferred to another. This traditional conception of learning assumes that knowledge is separate from context, and regards it as a discrete “substance” that can be transferred between people and between activities of learning (Seely-Brown & Duguid, 1989). Situated learning and cognition is a theory of learning that attempts to understand learning as a situated activity in which knowledge development needs to take place in the same context in which it will be used (Lave & Wenger, 1991). When knowledge and context are separated, knowledge is seen as a product of learning, rather than as a set of tools that can be used to solve problems (Herrington & Oliver, 2000). In other words, knowledge is inert because it is bonded with the situation in which it was learned. Physiotherapy education – and other forms of professional or scientific disciplines – can be seen as a community in which students are introduced to the tools (i.e. the knowledge, skills and attitudes) of the community. This allows the student to be gradually introduced to what it means to be a practising member of the community, to be a *legitimate peripheral participant* (Lave & Wenger, 1991). This is done by creating opportunities for students to engage in authentic activities that require them to use the tools to solve contextually relevant problems within the community. Teachers use strategies like modelling, coaching, scaffolding and articulation to help “enculturate” the novice into thinking and behaving like practitioners (Hedegaard, 1998).

One broad approach to teaching and learning that may help to move students' minds towards independent and critical thinking is known as inquiry-based learning (referred to as *inquiry* from here on). Inquiry is a collection of teaching and learning strategies aimed at promoting the development of higher order thinking by facilitators guiding students through the exploration of questions that they generate themselves (Justice et al., 2007a; Ovens et

al., 2011). The approach requires an environment that supports open discussion, questioning assumptions, and the critical evaluation of information, evidence and argument. Through inquiry, students develop the processes and skills they need for the independent exploration of concepts and facts, thereby preparing them for lifelong learning (Justice, Rice, Roy, Hudspith, & Jenkins, 2009). In addition to the emphasis on research, learners who actively engage with content develop a deeper understanding of it, compared to traditional didactic and memory-oriented strategies to teaching and learning (Abdal-Haqq 1998). Inquiry as a teaching method tries to encourage curiosity and the urge to explore and to understand, as motivators leading to learning through personal engagement (Justice et al., 2009). However, giving the student more responsibility for learning does not excuse the teacher from the responsibility of teaching. It is the role of the teacher to provide opportunities for engagement and transformation, but with the understanding that these outcomes cannot be achieved unless the learner exploits the opportunities (Veletsianos, 2011).

One of the ways in which teachers can create opportunities for learning is by developing authentic activities that encourage the student to think and behave as they would in the real world. Herrington, Reeves and Oliver (2010) describe nine elements of authentic learning as a teaching framework that enables teachers to operationalise situated learning theory, and can be seen in Table 1.1 below.

Table 1.1: Nine elements of authentic learning

Element of authentic learning	Guidelines for implementation
1. Provide authentic contexts that reflect the way knowledge will be used in real life	<ul style="list-style-type: none"> • A physical environment reflecting real use • A non-linear design • A large number of resources • No attempt to simplify the environment or task
2. Provide authentic activities	<ul style="list-style-type: none"> • Activities have real world significance • Activities are ill-defined • A single complex task • An opportunity for students to define the tasks • A sustained period of time for investigation • The opportunity to detect relevant information

Element of authentic learning	Guidelines for implementation
	<ul style="list-style-type: none"> • The opportunity to collaborate • Tasks which can be integrated across subject areas
3. Provide access to expert performances and the modelling of processes	<ul style="list-style-type: none"> • Access to expert thinking and modelling processes • Access to learners in various levels of expertise • Sharing of stories • Access to the social periphery
4. Provide multiple roles and perspectives	<ul style="list-style-type: none"> • Different perspectives on the topics from various points of view • The opportunity to express different points of view • The opportunity to criss-cross the learning environment
5. Support collaborative construction of knowledge	<ul style="list-style-type: none"> • Tasks which are addressed to a group rather than an individual • Classroom organisation into pairs or small groups • Appropriate incentive structure for whole group achievement
6. Promote reflection	<ul style="list-style-type: none"> • Authentic context and task • Non linear navigation • Opportunity for learners to compare with experts • Opportunity for learners to compare with other learners • Collaborative groupings of students • Students should reflect both while working on a task, and following the completion of the task
7. Promote articulation	<ul style="list-style-type: none"> • A complex task incorporating inherent opportunities to articulate • Groups to enable articulation • Public presentation of argument to enable defence of learning
8. Provide coaching and scaffolding	<ul style="list-style-type: none"> • A complex, open-ended learning environment • A non-linear multimedia design • Guidelines for the use of the program in a variety of contexts

Element of authentic learning	Guidelines for implementation
	<ul style="list-style-type: none"> • Collaborative learning • Recommendations that the lecturer is available for coaching
9. Provide for authentic assessment of learning within the tasks	<ul style="list-style-type: none"> • Fidelity of context • The opportunity for students to craft polished, performances or products • Significant student time and effort in collaboration • Complex, ill structured challenges • Assessment to be seamlessly integrated with the activity • Multiple indicators of learning • Validity and reliability with appropriate criteria for scoring varied products

This framework can be used by teachers to create authentic learning environments that enable students to think and act as they would in the real world. The reader should note that the concept of authentic learning was incorporated as a significant aspect of this project, and was used as a foundation for the overarching method that informed the study.

1.4. Graduate attributes in higher education

In this new world, it's not just what you know that counts—it's your capacity to think and learn throughout your life, communicate, and above all, collaborate.

Tapscott (2006)

Many higher education institutions are beginning to emphasise more general aims and higher level academic abilities, including self-directed learning, collaborative problem solving, team building, and identifying, accessing, assimilating and communicating information (Ramsden, 2003). There is increasing pressure on institutions of higher learning to produce graduates who go beyond being knowledgeable in a field or discipline. Universities should aim to inspire and enable students to grow intellectually, to be well-prepared for work, contribute effectively to society and achieve personal fulfilment.

University graduates should aim to increase knowledge and understanding for their own sake and for the benefit of the economy and society. Finally, graduates should serve the needs of an adaptable, sustainable, knowledge-based economy at local, regional and national levels (Laurillard, 2012). These ambitious aims impose on teachers a much more challenging task than simply being knowledgeable in their respective fields (Laurillard, 2012). Indeed, as noted above, inquiry-based learning changes the relationship between teacher and student, which means that teachers must move from being content experts to facilitators of student-directed learning (Justice et al., 2009).

The characteristics of holistic graduates include, but are not limited to “the skills and competencies that build the foundations for lifelong learning, including, critical, analytical, problem-solving and communication skills, as well as the ability to deal with change and diversity, in particular, the tolerance of different views and ideas” (Department of Higher Education, 1997). Unfortunately, while the description of graduate attributes seems quite straight forward, how to develop them is less clear. Barrie (2007) suggests that these attributes encompass more than skills and should therefore be developed as part of the *process* of higher education, rather than simply as products.

It seems then that there are many challenges facing those who are looking to adopt an approach to clinical education using teaching and learning practices that take into account the complexity of clinical education. In addition, even though our understanding of how students learn has evolved, clinical teaching methods have remained focused on didactic methods that do little to facilitate the development of higher order thinking required for capability in healthcare. If clinical educators are to change their teaching practices, there needs to be a change in culture and mindset in order to create space in the curriculum for these new strategies. The following section will explore the potential of technology to facilitate change in higher education.

1.5. Technology and blended learning

We need technology in every classroom and in every student and teacher's hand, because it is the pen and paper of our time, and it is the lens through which we experience much of our world.

David Warlick (2006)

As human society has become increasingly networked in a digital age, we see that few of the changes affecting it have been integrated into higher education. Laurillard (2012) has even suggested that the variety and power of technology means it will be difficult for institutions to integrate it, and that they will instead have to adapt in order to fully embrace the affordances of technology. Wiley and Hilton (2009) describe six ways in which institutions of higher learning can adapt in order to take advantage of technology, as illustrated in Table 1.2 below.

Table 1.2: How higher education needs to make use of technology

Higher education needs to move from:
<p><i>Analog → Digital</i></p> <p>Established industries have moved to digital formats as the primary means of information capture, storage and dissemination. The most conspicuous of these has been the entertainment industry, including music, movies and news publications. Higher education however, is still working in a largely analog world, where paper-based materials limit the extent to which they can be modified, extended and re-distributed.</p>
<p><i>Tethered → Mobile</i></p> <p>Many activities that were traditionally tied to a physical location are now more accommodating. For example, mobile phones and laptops have increased the flexibility of where work can be done. But many lecturers still forbid students to use laptops and mobile devices in class.</p>
<p><i>Isolated → Connected</i></p> <p>Perhaps more than any other technology, the Internet has fundamentally changed many aspects of our lives. From communication to commerce to travel, our real time connections to people, places and information has opened up ways of interacting with the world that were not possible just a few years ago. Yet, students are often required to sit quietly in class, listening to one person speak to them, isolated from everyone around them.</p>

Generic → Personal

We are able to customise almost any aspect of anything we buy, from our phones with apps, ringtones and covers, to our cars, clothes and hairstyles. Our online purchases and search history are associated with the aggregated data of thousands of other users, so that we can get personalised recommendations. But all students get the same course readers, handouts and lectures, regardless of what they need for their own learning.

Consumers → Creators

The technology required to create and distribute content were once the domain of corporations and wealthy individuals. The commoditisation of hardware and software has seen the introduction of cheap hardware and software that allows anyone to capture, modify and publish digital text, video and audio. The high barrier to entry has almost disappeared, and we no longer just read and watch what others have produced. Now, we are producers too. However, students are often not required to produce any of their own learning materials. Even when they “create” an essay or assignment, it is usually only a reproduction of the work of others.

Closed → Open

Sharing content is no longer an expensive activity, and the per unit cost of digital distribution has dropped to essentially zero. This has led to sharing of digital content on a massive scale, ushering in an age where much of the world's information is accessible to anyone with an internet connection. Yet, higher education carefully guards access to knowledge and expert performance.¹

In each of the above areas, there are many examples of the ways in which higher education has lost ground to society, leading to a disconnect between how the world is, and how we prepare students to interact with it. How can we prepare students to engage successfully in the world, when the learning spaces we create are so far removed from how the world actually is? One way in which this change in higher education may be facilitated is through the careful and intentional use of technology. Veletsianos (2010, p. 12) has defined *emerging technologies* as:

Tools, concepts, innovations, and advancements utilized in diverse educational settings (including distance, face-to-face, and hybrid forms of education) to serve varied education-related purposes (e.g., instructional, social, and organizational goals)

¹ It is noted that several higher education institutions (e.g. MIT, Harvard and the Open University) do share their course materials and even publish recorded lectures. However, these institutions are still in the vast minority.

It should be noted from Veletsianos' definition that *emerging technologies* are not only different from *information and communication technologies (ICTs)*, but that they may not even be a technology in the traditional sense of the word. In addition, technologies that are emerging have not yet been incorporated into mainstream use and are those that have the potential to have a major impact in a variety of global sectors within a five year period, including education (Johnson, Smith, Willis, Levine, & Haywood, 2011). Therefore, while the technologies used in education may include those that are emerging, it is not necessary that they are.

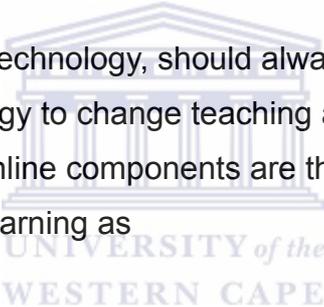
The emergence of information and communication technology (ICT) as a transformative and empowering medium for change in higher education is becoming increasingly evident (Katz, 2008; Greenhow, Robelia, & Hughes, 2009; Siemens & Tittenberger, 2009). The promise of technology in education lies in its use as a means to bring about powerful forms of meaningful, transformative learning, rather than reinforcing current educational structures by making them more efficient (Veletsianos, 2011). As mentioned earlier, the social construction of knowledge is dependent on language and symbols as a means of communicating abstract ideas through discourse (Vygotsky, 1978). If technology can be used to enhance communication, providing richer and more meaningful platforms for discussion, it may have a role to play in the social construction of knowledge. Technology may therefore be used to operationalise social constructivism in both physical and virtual spaces, in a blended approach to teaching and learning.

However, the predominant use of technology in education has been to reinforce traditional teaching approaches by improving the efficiency of content delivery without a qualitative improvement in learning (Wilson, Parrish, & Veletsianos, 2008). It seems that before continuing any further, we must ask if the value in higher education is in the carefully controlled access to expert knowledge, or is it to be found in the engagement and interaction that arise from discussion (Cormier & Siemens, 2010)? If educators believe that the purpose of higher education is to deliver content to students, then it follows that their use of technology will conform to that model of teaching. Access to technology in itself will therefore have a limited impact on learning outcomes, often merely reinforcing passive,

teacher-centred, didactic teaching (Herrington et al., 2009).

Recent theoretical and technological advances in online learning suggest that technology can be used to design novel learner experiences and opportunities for engagement within online communities (Veletsianos, 2011). Educators must resist the idea that, especially with the use of technology and the range of learning materials available online, students must do it for themselves. Rather, the teacher now has an even more critical role – not simply as a mediator of articulated knowledge, but deeply involved in scaffolding the thinking and learning processes necessary for the development of digital literacies (Laurillard, 2012). The medium, however, as always, is less important than the way in which learning is approached, with technology having the potential to shape *what* is learned by changing *how* it is learned (Laurillard, 2012).

Since the pedagogy, and not the technology, should always be the emphasis when exploring the potential of technology to change teaching and learning practices, it may be that a blend of face-to-face and online components are the most viable. Garrison and Vaughan (2008) define blended learning as



the thoughtful fusion of face-to-face and online learning experiences...such that the strengths of each are blended into a unique learning experience.... Blended learning is a fundamental redesign that transforms the structure of, and approach to, teaching and learning (p. 5)

Of particular interest is the use of social software (e.g. blogs, wikis and social networks) that enable distributed groups of loosely connected people to spread more ideas, more quickly than ever before (Katz, 2008). By changing the nature of communication, technology has the potential to change the relationships between educators and students, but that requires a concomitant change in both pedagogy and curricula. These relationships are presented in Illustration 1.1 below, with a brief description of each interaction.

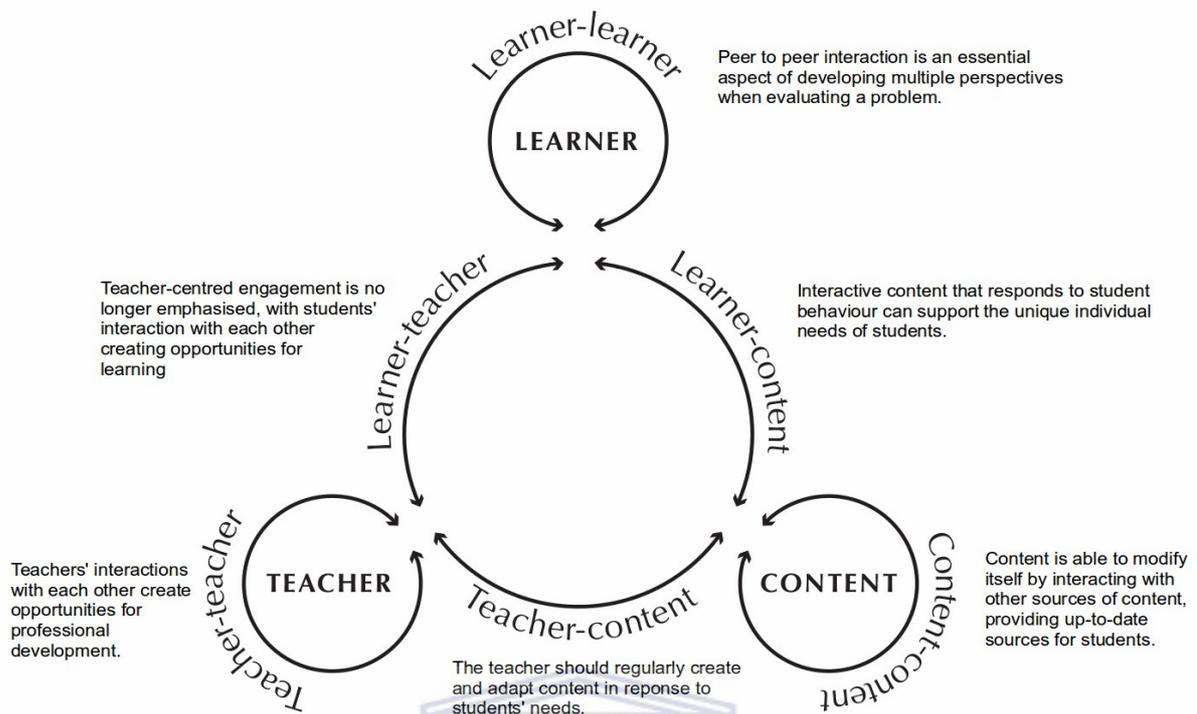


Illustration 1.1: Different forms of interactions in teaching and learning with technology, adapted from Anderson (2008, p. 58).



Interaction via the intentional use of technology must be used as part of an integrated approach that aims to develop higher order thinking, problem solving skills, and critical thinking. We should look at using technology to create authentic learning experiences in the classroom that are inquiry-based, and which lead to critical thinking. By engaging in shared learning experiences that extend beyond the walls of the classroom, we may be able to provide learners with opportunities to develop the knowledge and mindsets necessary to “participate in complex, ever-shifting real world situations in which coming to know is as important as knowing” (Cormier & Siemens, 2010, p. 38).

1.6. Challenges when implementing new teaching approaches

As with any innovative approach to change, there are challenges that we need to be aware of. In this context, the most obvious are the resistance to change found when implementing new teaching strategies, as well as the difficulties associated with integrating

technology into teaching and learning practices.

New teaching strategies

When introducing a new approach to teaching and learning – like inquiry-based learning – challenges may arise because of tensions between the change strategists (those who are driving the change), change organisers (those implementing the change) and change recipients (those on the receiving end of the change). The new teaching approach may fail due to interacting variables that are part of the structural features of the organisation, or because of individuals who resist the change (Devos, Buelens, & Bouckenoghe, 2007). Individuals may work against new approaches to teaching if they have become comfortable with their roles in the institution and see changes as an intrusion on what they know. Academics who prefer to teach from a position of authority may feel threatened and vulnerable with the introduction of a teaching approach that focuses on student-centred learning, which leaves them feeling like they're losing control. The change may also be perceived as adding to their existing workload without the rewards associated with research, as well as providing less freedom to teach what and how they would prefer. It is also not uncommon for students to rate teachers' practices lower, when inquiry-based learning is first implemented, which may lead to some academics being reluctant to introduce it.

To help address these particular challenges, it is essential that the institution provide support for academics who are implementing student-centred approaches to teaching and learning. For example, they might offer increased compensation for working over time, compared to the rates for other courses, or by offering funding for conference attendance, workshops and books related to inquiry, or by highlighting the research opportunities that arise whenever change is implemented (Justice et al., 2009). Change is clearly found to be unsettling for all stakeholders and therefore all staff and students should be actively involved throughout the process of curriculum development (McLean, 2003).

Integrating technology into teaching and learning

Challenges that arise with the integration of technology into teaching and learning

practices are no less problematic. Some students have reported difficulty adjusting to the structure of online courses and managing their time in such environments (Marino, 2000). In online activities, the physical absence of the teacher and the increased responsibility demanded of learners to effectively engage in learning tasks may present difficulties for learners, particularly those with low self-regulatory skills (Dabbagh & Kitsantas, 2005). It should be noted that dependent, or novice learners, are less self-regulated, and need frequent direction and reinforcement from a visible facilitator, and may subsequently feel frustrated in fully online courses. These frustrations could be eased if the online activities are combined with periodic opportunities for face-to-face interactions (Rovai & Jordan, 2004). It was also found that many students studying in undergraduate programmes and part-time postgraduate programmes indicated their preference for retaining some form of face-to-face teaching while at the same time taking advantage of e-learning (Lee & Chan, 2007).

In addition to the challenges of poor digital literacy, there is evidence of a widening gap between those with access to technology, and those without. Blended learning is highly context dependent, so it cannot easily be generalised from one domain to another, which means that technology-integrated solutions that work in developed countries may not be appropriate for developing countries.

Even with growing access to the Internet and to wireless communication, abysmal inequality in broadband access and educational gaps in the ability to operate a digital culture tend to reproduce and amplify class, ethnic, race, age, and gender structures of social domination between countries and within countries.

Castells (2009, p. 57)

We must therefore be wary of implementing technological solutions in contexts that add little to the learning experience, and instead would serve only to widen the gap between those with the necessary digital literacies, and those without.

There is also the challenge of educators who believe that the students of today are more comfortable with the use of technology as part of their learning practices, and describe a split between those who fit into this category, and those who don't. The categories are often described as “digital natives”, those who are comfortable navigating digital spaces, and “digital immigrants”, who are obstinately tied to old media, and who cannot keep up with the times. The argument is also commonly presented as those who belong to the “Net Generation, and those who do not. This generalisation, at its worst, is associated with a sense of moral panic, in which there are generalised concerns about the impact of modernity on society (Bennett, Maton & Kervin, 2008). There is often a narrative of transformation and rupture in which the fundamental continuity between the past and the future are destroyed. At the other end of the spectrum is a positive, emotional appeal towards a Utopian view of technology that liberates and empowers young people, enables global citizenship, and creates opportunities to communicate with each other in free and creative ways (Thomas, 2011).

The challenge is that technology progresses incrementally, rather than in huge leaps forward, and is therefore more of an evolution than a revolution. It is rare that any technology simply replaces an older one. They are developed, designed and marketed in social contexts, which reflect broader economic, cultural and social factors. In other words, technologies have affordances² but cannot produce social change in themselves (Thomas, 2011).

The “Net generation” argument overstates the differences between generations, and understates the diversity within them. These students do not necessarily have the skills, competency or natural fluency they are assumed to have. In fact, much of their use of technology is mundane, rather than spectacular, offering few examples of innovation and creativity, but rather routine communication and information retrieval activities. The debate makes young people seem strange, exotic and different, even though they have the same concerns, interests and preoccupations as children in previous generations. The argument is therefore a sentimental one, being mixed up with a fear of what is happening to young

² “The term *affordance* refers to the perceived and actual properties of a thing, primarily those fundamental properties that determine just how the thing could possibly be used” (Norman, 1999).

people today (Thomas, 2011).

This simplistic characterisation of young people and their use of technology has little that is meaningful to offer anyone interested in integrating technology into teaching and learning practices. The assumptions underlying descriptions of a generational difference are generally superficial, and particularly so in the context of education, which is influenced by so many factors other than age (e.g. socio-economic background, culture, etc.). To base pedagogical practices on anything as simplistic as an age-delineated category is to build on unsteady foundations (Thomas, 2011).

There are significant challenges inherent in a process of integrating technology into teaching and learning practices, especially in developing countries like South Africa. These include a general lack of physical and epistemological access to technology, as well as a poor understanding of how students use technology as part of their learning practices. While there is a body of international literature exploring these topics, there is a lack of literature in the local context that would be useful for healthcare education in developing countries. In addition, blended learning is highly context dependent, meaning that it cannot easily be generalised from other domains (Harris, Connolly, & Feeney, 2009).

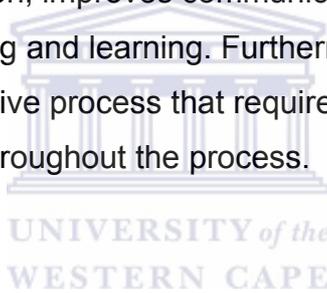
Based on the information presented, it is evident that there are a range of challenges in the context of higher education in general, and clinical education in particular. There are several fundamental aspects to consider, each bringing its own set of characteristics confirming that this is a difficult problem to solve:

- Clinical practice is, in itself complex, requiring a range of knowledge, skills and attributes that go beyond knowing what to do. The healthcare professional must be able to adapt to a complex and dynamic clinical environment, exhibiting clinical reasoning, critical thinking and an ability to solve problems in real time.
- Developing the knowledge, skills and attributes in undergraduate physiotherapy students involves an approach to teaching and learning which is not well-served by didactic methods that treat the student as a passive recipient of curated content.
- Inquiry-based learning is an approach to the curriculum that may help students to

develop the kinds of thinking that they need in the clinical context. However, implementing this kind of strategy is difficult, requiring changes not only to the teaching methods, but also to assessment and learning practices.

- However, there is evidence that the integration of certain types of technology (i.e. those that would facilitate enhanced forms of communication) into the undergraduate physiotherapy curriculum may help to bring about the kind of inquiry-based learning that may lead to the development of capability that is necessary for professional practice.

In conclusion, institutions of higher learning must evolve as they move toward supporting the changing needs of a new generation of healthcare students, and the changing healthcare needs of the country. The use of technology has been shown to facilitate this process, as it enables collaboration, improves communication and can facilitate a social constructivist approach to teaching and learning. Furthermore, it must be borne in mind that curriculum reform is a disruptive process that requires buy in from all stakeholders and as such, they must be included throughout the process.



1.7. Problem statement

The complex healthcare needs of a country require professionals who possess a range of knowledge, skills and attitudes that go beyond what a traditional curriculum prepares them for. In addition to competence (i.e. *knowing what* and *knowing how*), they need to display the ability to adapt to a changing environment, which requires critical thinking and clinical reasoning skills, and which is difficult to develop with traditional teaching and learning strategies. In other words, current approaches to clinical education do not adequately prepare healthcare students to meet the healthcare needs of the population, in the sense that they are not graduating prepared for independent practice.

Undergraduate physiotherapy students at the University of the Western Cape are taught mainly using a didactic approach (i.e. lectures), which does not in itself lead to the development of clinical reasoning, critical thinking and problem-solving skills. This teaching approach also does not help with the development and assessment of graduate attributes,

which have been identified as important aspects of a well-rounded, holistic university graduate. This is not to say that current and past students are not able to think and practice as clinicians, but rather that the opportunities to develop these skills in the classroom are not taken advantage of.

There is some evidence that a blended approach to teaching and learning may facilitate the development of graduates who are more capable of reflection, clinical reasoning and critical thinking, who can adapt and respond to the clinical context. If these attributes can be developed as part of a blended approach to clinical education, there is a greater possibility of graduating students who are capable of working as fully autonomous practitioners who not only demonstrate competence, but capability in the face of a dynamic and complex healthcare system.

1.8. Aim of the study

The aim of this study was to design, implement and evaluate a blended approach to teaching and learning within a South African physiotherapy department, with the aim of creating guidelines for learning environments that aim to develop capability in undergraduate physiotherapy students.

1.9. Objectives of the study

The objectives of this study were to:

1. Assess the impact of blending learning on healthcare students' clinical competencies as part of clinical education in an international context.
2. Determine physiotherapy students' experiences with, and attitudes towards, the use of technology in their learning practices.
3. Explore theories of learning and technology-aware teaching frameworks that could be used to inform the development of a blended approach to clinical education.
4. Determine the methods and challenges of integrating technology into teaching and learning practices within this department, through two pilot studies:
 1. The use of a wiki to facilitate collaborative learning.
 2. The use of an online social network to develop reflective reasoning.

5. Determine the characteristics of a blended learning module in the context of South African healthcare education, taking into account the following:
 1. Desirable attributes of capable and competent healthcare professionals.
 2. Teaching strategies used by clinical educators to develop those attributes.
 3. The use of technology to enhance those teaching strategies.
6. Design a blended learning module, using appropriate theoretical frameworks and input from preparatory studies.
7. Determine changes in students' learning practices after using a collaborative online environment to create an authentic learning space.
8. Develop design principles that could be used for curriculum development that aims to develop capability in undergraduate physiotherapy students.

1.10. Research questions

The purpose of this research project aimed to answer the question: “How can capability be developed in undergraduate physiotherapy students, using appropriate technology to change teaching and learning practices?”

In order to answer the main research question, the following questions were derived in relation to the specific objectives mentioned in the previous section:

1. How is blended learning used to develop healthcare students' clinical competencies as part of clinical education?
2. How do undergraduate physiotherapy students use online technology as part of their learning practices?
3. What technology-aware models of teaching are derived from learning theories that could be used to inform the design of a blended learning module?
4. What are the challenges of integrating technology into teaching and learning in clinical education? This question was explored with two pilot studies:
 1. How do undergraduate physiotherapy students use a wiki to collaboratively develop content in small groups?
 2. How can an online social network be used to better understand students' perceptions of their clinical experiences, and facilitate reflective reasoning to

develop practice knowledge?

5. What are the characteristics of a blended learning module that seeks to develop capability and competence in South African healthcare students?
6. How can we use collaborative online environments to create an authentic learning space?
7. What are the principles that clinical educators can use to design learning environments that aim to develop capability in physiotherapy students?

1.11. Significance of the study

Facilitating the development of problem-solving, critical thinking and clinical reasoning is a challenge in healthcare education. New graduates must not only be competent in terms of the knowledge and skills that they need to provide high-quality patient care, they must also be capable of adapting and responding to dynamic and complex clinical environments.

There is evidence to suggest that blended learning may improve teaching and learning outcomes in the context of clinical education by helping to develop professional attributes that go beyond the acquisition of knowledge and skills. This study identifies a strategy for the design, implementation and evaluation of a blended learning module in clinical education, which will help create learning spaces conducive to the development of attributes that play an important role in professional development.

The results of this study have implications for clinical educators across a range of healthcare professions. It identifies the benefits and challenges of the approach, and makes suggestions for educators who are interested in integrating technology into their own educational contexts as part of an approach that aims to develop critical thinking, clinical reasoning and problem-solving. The study has explored a range of technology-mediated approaches, learning theories and teaching frameworks, as well as an innovative approach to curriculum design and evaluation, which has implications for students, teachers, and curriculum planners. While this study builds on well-established practices within the context of clinical education and higher education in general, it also encourages a rethinking of traditional teaching and learning practices that have important consequences for the education of healthcare professionals, not only in South Africa, but

internationally.

1.12. Definition of terms

Affordance – Describes the perceived relationship between an actor (usually a person) and the world. The relationship is what the actor perceives the action of an action to be, rather than what it really is. Affordances specify the range of possible activities that can be performed upon an object or system, but must be visible to the actor in order to be perceived, and therefore describe properties of the real world (Norman, 1999). In the context of teaching and learning with technology, *affordance* refers to activities that the student is able to do as a result of the selected technology platform e.g. sharing, communicating and discovering (McLoughlin & Lee, 2007).

Blended learning – A combination of face-to-face and online learning experiences that represents a restructuring of the teaching and learning interaction in ways that extend the capabilities of both approaches (Garrison & Vaughan, 2008).

Blog – A blog is a combination of the words “web” and “log” and is a site consisting of discrete entries called "posts" that are presented in reverse chronological order i.e. the most recent posts appear first. Blogs allow almost anyone to post content on the web, enabling the publication of information in a way that was previously reserved only for large, centralised, and wealthy corporations. Bloggers can embed rich media (e.g. images, video and audio content) into their blogs, creating enhanced content that extends what is possible with text alone. Finally, blogs allow commenting by readers, enabling a two-way conversation between the content creator and content consumer, on an international scale that was impossible before their advent (Quinn, Duff, Johnston, & Gursansky, 2007; Wiley & Hilton, 2009).

Capability – The extent to which individuals can adapt to change, generate new knowledge, and continue to improve their performance. Capability can be developed when educators focus on supporting learners as they construct their own goals, based on feedback, and avoiding prescriptive tasks (Fraser & Greenhalgh, 2001). In the context of

this study, *capability* refers to a set of outcomes that include critical thinking, clinical reasoning and problem-solving.

Clinical education – Clinical education has traditionally been viewed as the supervised learning of professional skills that takes place in the clinical context (Lekkas et al., 2007). However, this creates challenges as a result of the complexity of the clinical environment that makes it a difficult space to control. Perhaps clinical education should be thought of as the teaching and learning that takes place in any environment that presents students with opportunities to think and behave as a novice clinical practitioner.

Clinical reasoning – A way of thinking about clinical problems that allows students and healthcare professionals to develop pathways through dynamic and complex clinical problems, which may not have simple solutions. It is a cognitive process that enables practitioners to evaluate and manage a patient's problem. This cognitive process can include an intuitive pattern of thinking that is below the threshold of conscious thought, as well as a rational thinking pattern that occurs deliberately, using information and rules that are acquired through learning (Pelaccia, Tardif, Tribby, & Charlin, 2011).

Competence - What practitioners know or are able to do in terms of knowledge, skills, and attitude. Traditional education emphasises the development of competence that involves performing familiar tasks in familiar environments (Fraser & Greenhalgh, 2001).

Emerging technologies - Tools, concepts, innovations, and advancements that are used in diverse settings (including distance, face-to-face, and hybrid forms of education) to serve various purposes (e.g., instructional, social, and organisational goals). They can be defined and understood in the context of the following five characteristics (Veletsianos, 2010):

- They may or may not be new technologies
- They are evolving organisms that exist in a state of “coming into being”
- They go through hype cycles
- They satisfy two “not yet” criteria:

- They are not yet fully understood
- They are not fully researched in a mature way
- They are potentially disruptive but their potential is not fully realised

Epistemological access – Access to learning can be defined in two ways (Morrow, 2007):

- Formal access to the institution of learning, which includes physical access to the institution e.g. classrooms and computers
- Epistemological access is access to knowledge, which is dependent on students' current state of knowledge and ability to access the kinds of academic knowledge presented by higher education institutions

Inquiry-based learning – An approach to learning in which meaning is constructed through critical analysis, reflection, construction and confirmation of worthwhile knowledge. Inquiry-based learning is a collection of teaching and learning strategies aimed at promoting the development of higher order thinking by facilitators guiding students through the exploration of questions that they generate themselves. The approach requires an environment that supports open discussion, questioning assumptions, and the critical evaluation of information, evidence and argument. Through inquiry-based learning, students develop the processes and skills they need for the independent exploration of concepts and facts, thereby preparing them for lifelong learning (Ovens, Wells, Wallis & Hawkins, 2011).

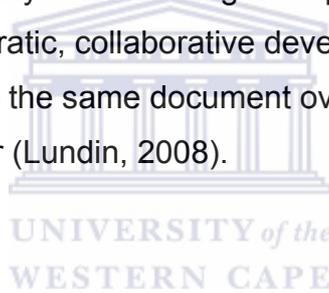
Small group learning – Indicative of a student-centred approach to learning, small group learning is characterised by student participation and interaction, where the size of the group is less important than its characteristics. The small group of students is facilitated by a tutor, who guides the students through learning activities without dominating the session (Dent & Harden, 2005; Kitchen, 2012).

Social software – A collection of online technologies (e.g. blogs, wikis and podcasts) that enable people to have an online presence, to interact through comments and to serve as a vehicle for self-expression. It refers to any application or programme that enables

interactivity among users (Mason & Rennie, 2008). There are three aspects of social software that could potentially influence education; there is support for conversation between individuals or groups, support for social feedback, and support for social networks and relationships between people (boyd, 2007).

Student-centred learning – In this approach to learning, what the student learns is emphasised, rather than what is taught. As a result, students are given more responsibility for their education and the role of the educator changes from a transmitter of information, to a facilitator of learning (Biggs 2012).

Wiki – A wiki is a website that allows users to create, edit, or delete its content without needing to know anything about editing the background code that enables the World Wide Web to exist. Typically, users modify content using a simplified text editor via a web browser. Wikis enable the democratic, collaborative development of content, in the sense that many users can contribute to the same document over time, with each user having the same capability as any other user (Lundin, 2008).



1.13. Structure of the thesis

This thesis is structured in chapters that each represent a major aspect of the study, from the preliminary phases through to the conclusion, with each chapter presented as an article. Five of the earlier chapters have been published, while the later ones have been submitted and are under peer review.

The introductions and conclusions of each chapter have been written as bridging pieces, linking each study to the preceding one. Some of these bridging pieces are longer and more comprehensive than others, depending on the size of the conceptual “gap” between the papers, as well as the number of emergent concepts from each study that were explored before beginning the next aspect of the work.

The introductions and conclusions of some chapters also serve as a space for me to present personal reflections during the period of study, as part of a reflexive process that influenced the direction of the research project. I kept a public record of the process on my blog,³ as well as a private journal that I used to capture my thinking and feelings as I progressed along this path. I present excerpts from these reflections where they expose highlights and challenges that occurred over the course of the study.

1.14. Summary of chapters

Chapter One

Chapter One described the problem that this study aims to address. Clinical practice was briefly presented as a complex and dynamic process that requires a set of attributes that go beyond simple knowledge and skills. From this it follows that clinical education, the process of developing these attributes, is also complex and represents a challenge for clinical educators who aim to create opportunities in which these aspects of professional practice can be learned. While the emphasis of this research project is on clinical education, the introduction also explores higher education in general, in order to contextualise this study in the broader domain. Traditional methods of teaching and learning are explored, as well as alternative approaches that seek to address the problems

³ /usr/space (<http://www.mrowe.co.za/blog>)

inherent in traditional models. The use of technology is considered as one of the ways in which higher education can move towards changing teaching and learning practices, although it is noted that the use of technology brings its own challenges.

Chapter Two

Chapter Two describes the overarching research methods that were used as guiding frameworks throughout the study, as well as the different methods that were implemented in each phase of the process. Each chapter in the thesis represents one component of the larger study, and as such has its own research method described. While these methods are presented in detail in each chapter, Chapter Two describes the overall methods in detail, as well as including brief descriptions of the methods used in each chapter.

Chapter Three

Chapter Three describes a systematic review of the literature that was conducted to explore the potential of blended learning to improve students' clinical competencies in an international context. The chapter begins by discussing the complexity of clinical education, particularly in the development of non-technical skills that include reflection, clinical reasoning, critical thinking, bridging the knowledge-practice gap, and the development of practice knowledge. The lack of evidence in evaluating the process of clinical education is described, thereby highlighting an area in the literature that this study aims to contribute to. This chapter also serves to position the current study in an international context.

The methods of conducting the literature review are described, as well as the results of the study. These results are presented and discussed in the context of the broader local and international literature. The conclusion of the study is that blended learning may be useful to create custom interventions that are designed to address specific gaps in a curriculum. In addition, it was found that technology is most often used to support traditional approaches to clinical education, rather than to fundamentally change teaching and learning practices.

This chapter has been published as:

Rowe, M., Frantz, J., & Bozalek, V. (2012). The role of blended learning in clinical education: a systematic review. *Medical Teacher*, 34(4), e216-e221.

It has also been presented as:

Rowe, M., Frantz, J., & Bozalek, V. (2011). Blended learning in clinical education: a systematic review. Oral presentation at the AMEE conference, August, 2011, Vienna.

Chapter Four

Chapter Four describes a survey that was used to determine the online tools that were being used by physiotherapy students, and how they used those tools as part of their learning practices. The literature review of the chapter suggests that technology can be used in clinical education to develop non-technical skills like reflection and clinical reasoning through enhanced communication, discussion and feedback. However, if technology is to be integrated into the curriculum in a manner that is contextually relevant, input from students is an essential aspect to be considered. This is especially important in developing countries like South Africa, where students lack the physical and epistemological access to the use of technology as part of their learning.

This aspect of the study used a self-developed questionnaire to survey all undergraduate physiotherapy students in this department. The questionnaire was piloted and found to be reliable and valid. The main finding was that students used technology to gather information and for administrative tasks, rather than for discussion, interaction, collaboration and reflection. Therefore, if technology is to be integrated into an undergraduate physiotherapy curriculum with the aim of developing capability, students need to be well-prepared and supported.

This chapter has been published as:

Rowe, M., Frantz, J., & Bozalek, V. (2012). Physiotherapy students' use of emerging online technology as part of their learning practices. *South African Journal of Physiotherapy*, 68(1), 29-34.

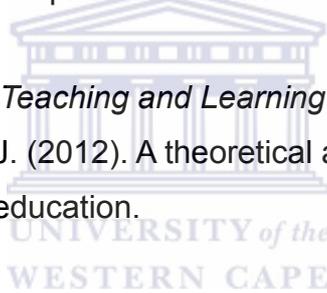
Chapter Five

Chapter Five consists of a narrative literature review of the learning theories and teaching frameworks that would become a foundation for developing a set of draft design principles that would inform the design of the blended learning module. It suggests that a traditional approach to medical education is based on learning theories that isolate the learner from the learning activity, the context and their peers, and goes on to identify socio-cultural learning theories as alternatives.

The chapter presents three “technology-aware” models of teaching that are derived from learning theories that incorporate the social, networked and distributed nature of knowledge. These theories are used to provide a foundation from which to develop principles that could be used to facilitate the kinds of learning that are necessary for students to adapt in response to complex clinical environments.

This chapter is under review with Teaching and Learning in Medicine as:

Rowe, M., Bozalek, V., & Frantz, J. (2012). A theoretical approach to technology-mediated teaching and learning in medical education.



Chapter Six

Chapter Six presents the results of a pilot study that was completed in the early stages of the project. The aim of this pilot project was to identify the challenges associated with students' use of an emerging technology for collaborative and interactive learning activities. It explores the advantages of using a wiki for the collaborative development of their own learning materials, specifically looking at their perceptions of groupwork, engagement and peer review as part of the process.

Students were given an assignment where they were required to develop content collaboratively in small groups. The results of the study highlighted the challenges that students face when working together in small groups, as well as the technological issues that arose around physical and epistemological access to the technology platform. The

lessons learned about groupwork from this pilot study had a significant impact on the design of the blended learning module, including the fact that we cannot make assumptions about these students' levels of technological literacy.

This chapter has been published as:

Rowe, M. (2012). The use of a wiki to facilitate collaborative learning in a South African physiotherapy department. *South African Journal of Physiotherapy*, 68(2), 11-16.

It has also been presented as:

Rowe, M. (2009). Collaborative knowledge construction using wikis. Oral presentation at the HELTASA conference, University of Johannesburg, November 2009.

Chapter Seven

Chapter Seven describes a pilot study conducted as part of a project that was run in association with the South African FAIMER⁴ Regional Institute. The chapter describes how a social networking platform can be used to facilitate the development of non-technical skills in a clinical context, using assisted performance as a teaching framework to guide the process.

The study found that students could use the online social network as a platform to describe clinical and ethical dilemmas that arose in the clinical context, and interact with each other around those experiences. The lecturer was able to use the network to help guide students' learning around the clinical stories that they shared. The use of assisted performance was found to be a useful framework to guide teaching and learning in the clinical context, in an online learning environment.

⁴ FAIMER is the Foundation for the Advancement of International Medical Education and Research. The Southern African Regional Institute of FAIMER is known as SAFRI. SAFRI accepts 16 Fellows every year to participate in a two year long programme of professional development in the areas of research and teaching in the context of medical education.

This chapter has been published as:

Rowe, M. (2012). The use of assisted performance within a social network to develop reflective reasoning in undergraduate physiotherapy students. *Medical Teacher*, 34(7), e469-75.

It has also been presented as:

Rowe, M. (2011). The use of a social network to facilitate the development of practice knowledge in undergraduate physiotherapy students. Oral presentation at the SAAHE conference, June 2011, North-West University, Potchefstroom.

Chapter Eight

Chapter Eight presents a Delphi study that aimed to identify:

1. The characteristics of competent and capable healthcare practitioners
2. Teaching strategies that could be used to develop competence and capability
3. The use of technology to enhance the teaching strategies that had been identified

The study used three rounds of surveys with three different expert panels, demonstrating a novel use of the Delphi approach. The first round of the Delphi study identified the attributes of healthcare practitioners that go beyond knowledge and skills, highlighting that an emphasis on the process of learning is more important than a focus on the products of learning. The second round of the Delphi determined that clinical educators should consider using a range of teaching strategies that include opportunities for interaction, discussion and reflection. They also emphasised the role of emotion and relationships in the development of professional capability. The third round of the study identified ways of integrating technology into those teaching strategies, acknowledging the affordances of technology that can change teaching and learning practices.

This chapter is under review with BMC Medical Education as:

Rowe, M., Frantz, J., & Bozalek, V. Beyond knowledge and skills: The use of a Delphi study to develop a technology-mediated teaching strategy.

Chapter Nine

Chapter Nine describes the creation and implementation of a blended learning module in the physiotherapy undergraduate curriculum. A set of design principles is presented, having being informed by lessons learned throughout the research process, and describing how the module was developed and implemented. The chapter also presents examples of how the design allowed for the module to be adapted in the early stages of implementation, as a result of student and staff feedback, as well as observations in the classroom and online spaces.

Chapter Ten

Chapter Ten describes the use of a technology platform to create opportunities for transformative learning in higher education, rather than simply reinforcing didactic teaching that aims to control access to expert knowledge. Technology was used to facilitate engagement and interaction around shared learning experiences that extended beyond the walls of the classroom. The aim of the strategy was to create learning opportunities to develop the patterns of thinking that students need to participate in complex, real world situations. Authentic learning was used as a framework to guide the implementation of a case-based, blended learning module in an undergraduate physiotherapy department. Google Drive was used as a collaborative online authoring environment in which small groups of students used clinical cases to create their own content, guided by a team of facilitators.

This paper describes an innovative approach to clinical education using authentic learning as a guiding framework, and Google Drive as an implementation platform. Evidence is presented to support the idea that this approach led to the transformation of student learning practices, altered power relationships in the classroom and facilitated the development of critical attitudes towards knowledge and authority.

This chapter has been submitted to the British Journal of Educational Technology as:
Rowe, M., Bozalek, V., & Frantz, J. (2012). Using Google Drive to facilitate a blended approach to authentic learning.

Chapter Eleven

Chapter Eleven describes the conclusions of the study, by summarising the major outcomes of each aspect of the larger research project. A set of principles are presented that provide a framework for clinical educators who aim to help develop capability in undergraduate physiotherapy students. The limitations of the project as a whole are discussed, making reference to the limitations that arose within each aspect of the larger study. Finally, recommendations are made for future curriculum development within this physiotherapy department, as well as those that may be relevant for clinical educators in other clinical professions in South Africa.



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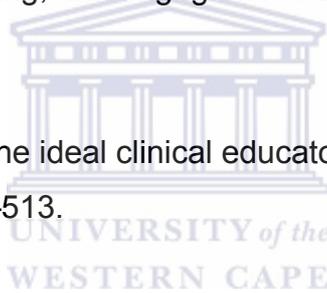
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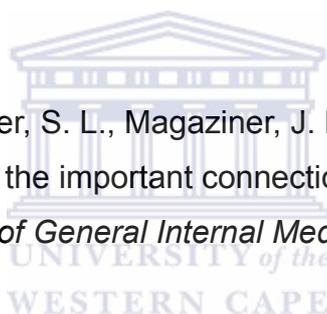
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2. Chapter Two: Methods used in the study

No battle plan ever survives contact with the enemy

Helmuth von Moltke (1851)

2.1. Introduction

Chapter One introduced the key concepts and themes that needed to be considered before proceeding with the study design. These included the challenges presented to clinicians in clinical practice in complex health systems, which introduced the reader to the range of attributes necessary for successful performance. If clinical practice requires more from practitioners than competence, then capability is what educators should aim for. Yet, most traditional approaches to clinical education use didactic teaching methods that do not in themselves lead students towards capability. Moving beyond the boundaries of clinical education, it is evident that many other teaching and learning strategies exist, some of which have significant promise as means of changing conceptions around pedagogy in the clinical context. The use of technology was also explored as having some potential to fundamentally change teaching and learning practices, specifically around enhanced forms of communication and interaction that can change relationships between teachers, learners and content.

In order to successfully explore these complex and inter-related ideas a range of research methods are discussed here, all of them guided by one overarching framework. Chapter Two presents the research framework that served as a guiding approach throughout the study, as well as briefly describing the methods used in each chapter. It begins by introducing the concept of a curriculum as a complex system with interacting variables that are difficult to control or predict, which makes it challenging to evaluate educational outcomes as a result of innovations in pedagogy. This suggests that the research method in this context must be capable of flexibility during the research process, adapting to the changing environment as new information is discovered. Three research methods that are relevant and appropriate for a study of this kind are explored and discussed, each of which served to inform and guide the process. These methods include action research, developmental evaluation and design research. While each of these methods had a significant influence on the manner in which the study was conducted, it was design

research that was used as a framework to develop the procedure that was used to guide the overall project.

2.2. The curriculum as a complex system

Reacting to the changing needs of a complex and dynamic situation requires real time adaptation, which often forces a change in even the best-laid plans. It may seem that a curriculum is a well-planned, organised entity, with specific courses of action and events that are bounded by time frames and the achievement of outcomes. But, because the concept of *curriculum* includes people, it introduces a range of influences, experiences and contexts that cannot be controlled or planned for. This is important to note because detailed plans can only work when all of the interacting variables and factors are controlled (Patton, 2011). In fact, when it comes to curriculum, the only thing that can be planned for is that it will continue to change and evolve in response to changes in the healthcare needs of society (Frenk et al., 2010).

“Learning in a self-organising curriculum allows teachers and students to co-evolve” (p. 25), so that knowledge production is relational and understanding is a process whereby participants are changed as a result of their interactions. Relationship-centred teaching becomes the focus of learning in a complex curriculum, and knowing emerges in the space between participants. The challenge lies in creating a process of teaching and learning in which teachers and students develop alongside each other, and which does not rely on the notion of knowledge transfer from expert to novice (Mennin, 2010). The expression of a clinical curriculum via the interactions, exchanges and learning that takes place within and outside of it, is therefore a complex system (Morrison, 2002). See Table 2.1 below for a description of the characteristics of complex, adaptive systems.

Table 2.1: Characteristics of complex adaptive systems

Nonlinearity. Demonstrating a sensitivity to initial conditions, in which small changes can lead to improbable, unpredictable and unexpected outcomes.

Emergence. Patterns emerge as a result of interaction between agents. The emergent pattern is unrelated to any shared intention of the agents, arising as each pursues its own

path.

Dynamic. Interactions between components of the system are volatile and turbulent, leading to unpredictable and rapid cascading effects.

Adaptive. Agents respond and adapt through interaction so that what emerges is a function of ongoing adaptation between interacting elements and their environment.

Uncertainty. Processes and outcomes are unpredictable, uncontrollable and unknowable in advance.

Coevolutionary. As self-organising agents interact and adapt, emergent connections evolve together over time as part of the system.

Adapted from Patton (2011)

A curriculum is therefore a complex, adaptive system in which people interact with each other and with curricular artefacts in ways that disturb the status quo, moving the system through a variety of states until a shared understanding or plan of action emerges (Doll, 1993; Mennin, 2007). The variables (people and things) that change the dynamics of the system are the control parameters which serve to orient teachers and learners, but do not determine specific pathways and outcomes. Examples of control parameters in a curriculum can be the learning outcomes, the “problem” in problem-based learning, a patient who the student engages with, teaching and assessment strategies, or a well-timed question (Mennin, 2010). A curriculum can therefore be thought of as the changing, complex relationships between many interdependent variables.

Since it is not possible to construct transformative experiences but rather to provide opportunities for transformation, the “learning” that happens in a curriculum is bound to include outcomes that were not planned or foreseen. This means that the outcomes associated with these learning opportunities may or may not be transformational. Consequently, the outcomes of the evaluation of activities that aim for transformation are difficult to measure using pre-determined objectives. (Veletsianos, 2011). It seems then that the research methods used to inform this project must be flexible and adaptable within a changing context in which the outcomes are unknown.

In light of this, the following methods were explored, and are described in more detail below:

- Action research as a form of personal inquiry
- Development evaluation as an evaluation framework
- Design research to develop implementation guidelines

While each of the methods above informed the study in some way, design research was selected as the primary methodological approach that was used to guide the project.

2.3. Research designs

This section will present three different research designs that were used to inform the research project as a whole, highlighting the conceptual contributions they made to the study. The three designs include action research, developmental evaluation, and design research.

a) Action research as a form of personal inquiry

Action research is a form of self-reflective enquiry that is undertaken in social situations in an attempt to promote successful, sustainable, and liberating change (Greenwood, 2007). It is an emergent, iterative process that changes as understanding increases over time (Patton, 2011). Action research is therefore about learning by doing. The main characteristics of action research are that (Susman, 1983):

- It requires separate but mutually dependent steps
- It is participative (the researcher and subjects actively participate in the process)
- It usually generates qualitative data
- It is a reflective process
- It is cyclical, with each cycle including phases that can be seen in Illustration 2.1 below

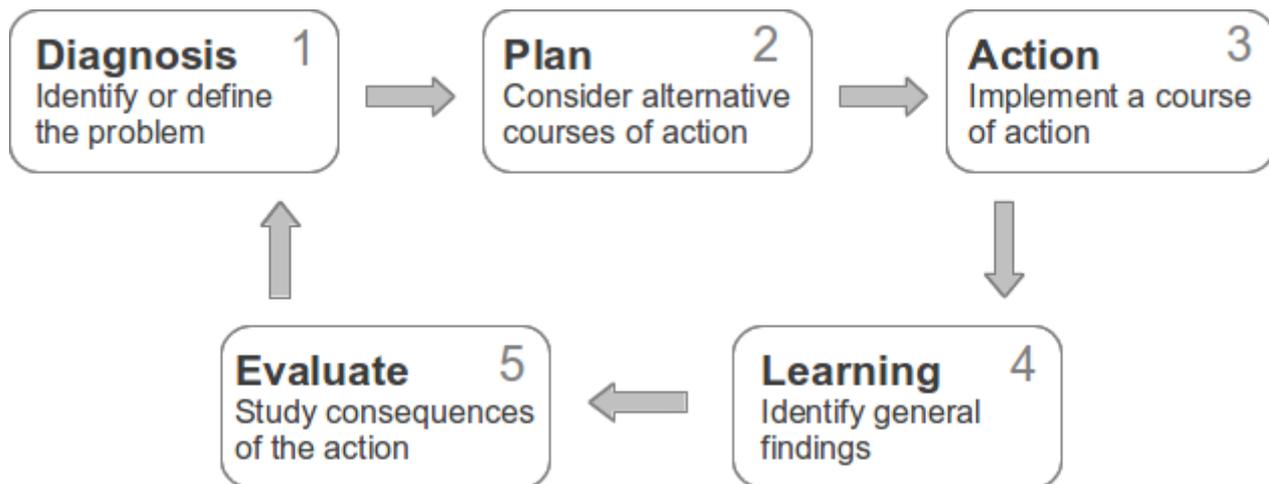


Illustration 2.1: The action research cycle, adapted from Susman (1983).

The approach encourages the systematic, iterative reflection on practice while implementing an action, in order to bring about improvement in that action or community in which the action occurs. Action research is therefore about taking action and effecting change within a community or group. In this way, it is not only a process for creating knowledge, but as a form of personal and professional development (Gaventa, 1988) as it tries to improve understanding of how changes in action or practices can benefit a community. Action research is therefore often used as a means of collaboratively addressing an identified problem through innovative approaches, and that learning from the process be available in order to inform progression towards a solution to the problem.

In order to implement this kind of “action research” approach to evaluation, the researcher must drive facilitation, negotiation, consensus building, partnering and innovation management. This requires giving feedback and engaging in dialogue, understanding the theory that informs changes in action, understanding of processes taking place, driving collaborative experiments and working to develop members within the community (Patton, 2011). In this context, the research method not only identifies possible solutions to the problem within the curriculum, but aims to develop staff members as part of the process. It is important for educators to evaluate their practice by questioning the underlying assumptions that give meaning and direction to their work, always seeking to answer the question, “How do I improve my practice?” (Farren, 2008).

“Learning has to be seen in context, embedded in settings and institutions both personal and economic; learning is an essentially embedded and social activity and cannot be decontextualised” (Patton, 2011, 281). Action research is again an appropriate choice since it does not emphasise the generalisability of a theory, but rather the uniqueness of a context, and is used to better understand that context (Bassey, 1995). Action research also challenges educators to shift their perspective from seeing learning theory as an abstract concept, to one in which the theory informs real world practice (Farren, 2008). Action research therefore combines analysis with action, and theory with practice (Patton, 2011).

Reflexivity is a concern for participant observers in qualitative research because the researcher is actually an instrument in the process (Patton 1990; Cohen, Manion, & Morrison, 2000). Reflexivity acknowledges that qualitative researchers are part of the situation they are investigating and necessarily have opinions about the situation. The researcher must guard against imposing their own constructs on participants in order to avoid bias (Richardson, 2009). Once the module began, I kept a diary of my own reflections as a way of articulating the thoughts and feelings that arose during the module. These reflections became my field notes, some of which were posted as public entries on my blog.⁵ The public nature of the blogging process served three purposes: it “kept me honest” in the sense that I was more thoughtful about what I posted knowing that the world could see it, it opened the door to a conversation in which I was now participating (Maslen, 2011), and it gave me a space to reflect on the process as it unfolded. Other postgraduate students, researchers and teachers could see what I was experiencing and provide additional insight and encouragement throughout the process. This conversation among colleagues opened up my own research experience to others, allowing me to be a part of an international community that reduced the feelings of loneliness and isolation that independent study can sometimes create (Lee & McCloughlin, 2010). The concern with relying solely on action research for this study, is that this method has traditionally been used in marginal projects that have not made any significant impact in higher education on a large scale (Greenwood, 2007).

In conclusion, action research is a method that aims to collaboratively evaluate actions

⁵ /usr/space (<http://www.mrowe.co.za/blog>)

that are implemented to bring about change. It involves the direct participation of the researcher in a dynamic, iterative process, monitoring and evaluating the effects of an action with the aim of improving practice. It was used to guide the investigator through a series of studies that were conducted in the real world, taking into account the impact of the researcher on the process itself. However, while the principles of action research influenced the research project, it did not have a strong enough pedagogical framework for the development of guidelines for integrating technology into clinical education on a large scale.

b) Developmental evaluation as an evaluation framework

The important thing is not to stop questioning

Albert Einstein (1955)

A traditional approach to evaluation is either formative or summative; formative to improve the intervention, and summative to test the intervention against a pre-determined set of outcomes. However, if a curriculum is a complex system in which outcomes cannot be predicted or controlled, then evaluation should aim to improve, rather than test (Patton, 2011). Developmental evaluation is a form of evaluation that does not aim to deliver a summative judgement of the merit or worth of an intervention, but rather supports its iterative adaptation based on real-time data that is gathered from a variety of sources. Whereas traditional evaluation attempts to control and predict - to bring order to chaos, developmental evaluation accepts the disorder, and adapts to the reality of non-linear dynamics in complex systems (Patton, 2011). Developmental evaluation therefore aims to identify and make sense of what emerges under conditions of complexity. If it is accepted that curricula are complex systems, and that their outcomes can not be predicted with any certainty, then a traditional approach to curriculum evaluation is inappropriate. Developmental evaluation should therefore be considered, which is sensitive, responsive and adaptive to dynamic contexts where outcomes are uncertain, unpredictable and uncontrollable (Patton, 2011).

In order to formalise the lessons learned during this process, data was gathered from multiple sources, not only to keep asking questions, but to make sure the right questions

were being asked. It was therefore important to identify a framework of inquiry for asking the kinds of questions that matter in complex environments (Parsons & Jessup, 2009). The Action-Knowledge-Belief framework of inquiry is premised on the fact that actions develop from a combination of what is believed and what is known, and that problems emerge when beliefs are treated as if they were knowledge (Patton, 2011). Fundamental beliefs can be so deeply ingrained that we no longer question them, to the extent that we begin to believe that our beliefs are, in fact, knowledge. By generating lessons learned from experience, and modifying behaviour accordingly, we can move towards developing a curriculum using knowledge based on evidence, rather than on beliefs (Patton, 2011).

Developmental evaluation is an action research-based inquiry framework that can be used to guide the iterative development, implementation and real time adaptation of an innovative strategy in a complex system. While initially it seemed that developmental evaluation would be an appropriate method to guide the process, it was clear that it aimed at evaluation within complex systems in general, rather than being linked specifically to the curriculum in the context of higher education. This is not to say that developmental evaluation did not influence this study, only that it is a research design that is not explicitly informed by theories of learning. I therefore turned to design research, which is a research method informed by theories of learning, that provides a structured framework for implementation, and that aims to develop guidelines for implementing and evaluating innovative changes in teaching and learning.

c) Design research to develop implementation guidelines

Chapter One introduced some of the challenges inherent in higher, and clinical, education, and explored some of the changes in pedagogy that might be used to address the problems that arise when implementing innovative changes in the curriculum. Authentic learning is a teaching framework that describes a set of guidelines for creating opportunities for learning, which are informed by situated learning theory and which are cognisant of complexity in learning. One of the main challenges is that complex tasks are inherently unpredictable in terms of their outcomes, and it is therefore difficult to foresee the design, implementation and maintenance challenges that will arise when developing innovative approaches to teaching and learning (Herrington, Reeves, & Oliver, 2010).

There has been an increase in reports of studies conducted into the use of technology in higher education, evident by the increase in publications in this domain. However, the most common type of research in educational technology tends to compare differences in the “delivery of learning” instead of determining the influence that pedagogical design has on learning. These studies also narrowly focus on small changes in specific courses and are therefore small scale and isolated (Reeves, 2003). If we are serious about investigating the educational benefits of integrating technology into teaching and learning practices, we need research methods that focus on the process of pedagogical change, rather than the product. However, changing the mental models of researchers from those that are experimental to those that are developmental is challenging, especially when given the prevalence of studies using experimental designs. Design research is an attempt to address the failings of other research methods into the use of educational technology. Van den Akker (1999, pp.8-9) describes design research as:

A search for innovative “solutions” for educational problems... .The ultimate aim is not to test whether theory, when applied to practice, is a good predictor of events. The interrelation between theory and practice is more complex and dynamic: is it possible to create a practical and effective intervention for an existing problem or intended change in the real world? The innovative challenge is usually quite substantial, otherwise the research would not be initiated at all. Interaction with practitioners is needed to gradually clarify both the problem at stake and the characteristics of its potential solution. An iterative process of “successive approximation” or “evolutionary prototyping” of the “ideal” intervention is desirable. Direct application of theory is not sufficient to solve those complicated problems.

Design research is therefore grounded in the practical reality of the teacher, who must identify educational problems that are significant to them, and iteratively develop solutions using approaches that are informed by a theoretical perspective. However, operationalising a theoretical framework through practical implementation is challenging, and teachers need effective models, principles and guidelines in order to challenge the dominant teaching practices in higher education today. Design research seems to be an effective way to address this need (Herrington, Reeves, & Oliver, 2010). In addition, it has

been used in other PhD projects that looked at ways of integrating technology into teaching practices (Herrington, 1997; McKenney, 2001).

Design research has the following characteristics (Reeves, Herrington, & Oliver, 2005, p. 103):

- A focus on broad-based, complex problems critical to higher education.
- The integration of known and hypothetical design principles with technological affordances to render plausible solutions to these complex problems.
- Rigorous and reflective inquiry to test and refine innovative learning environments as well as to reveal new design principles.
- Long-term engagement involving continual refinement of protocols and questions.
- Intensive collaboration among researchers and practitioners.
- A commitment to theory construction and explanation while solving real-world problems.

Design research requires that teachers explore important educational problems, rather than conduct research for its own sake. They do this by defining a relevant pedagogical outcome and then creating an environment for learning environments that support the achievement of the objective, emphasising pedagogy rather than technology. The learning environment must be adapted continuously as the process unfolds, informed by feedback and observation. Teachers must recognise and pay attention to supporting human interactions and nurturing learning communities, and reflect on the process to reveal design principles that can inform future development projects. This requires an emphasis on collaboration that is not necessarily true for other forms of research into educational technology in higher education, and which should aim to develop staff, as well as students. The design research process is iterative and lengthy, and therefore meant to be conducted over several years, and is not suited to studies that happen in the short term. If the results of the study are rewarding, the design research process may extend for even longer periods (Reeves, Herrington, & Oliver, 2005).

In concluding this section on research designs, it is clear that all three approaches that were described have a potential role to play in guiding the implementation of this project.

All three designs emphasise the iterative nature of investigation into innovations in higher education. They all describe learning as a complex social activity that cannot be well-controlled, with outcomes that cannot be predicted, and that take place in the real world. Research methods that explore learning should therefore adapt to the non-linear dynamics of complex systems, and not be used to form a judgement based on performance against pre-determined criteria. Instead, research into learning should aim to evaluate the process of learning, involving cycles of planning, implementation, assessment and reflection in order to consistently improve and develop the intervention.

2.4. Research setting

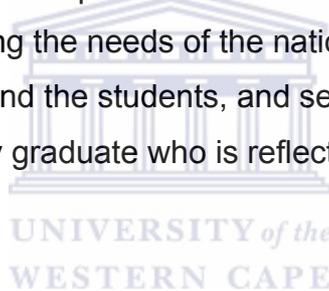
This research project was conducted in a physiotherapy department at the University of the Western Cape (UWC), Cape Town, South Africa. The University of the Western Cape is a public university in Bellville, established in 1960 by the apartheid government, as an institution for the education of non-white students for lower and middle civil service positions. In 1982, the institution opened its doors to all South Africans, publicly rejecting the notion of segregated education in its mission statement.

The institutional report of the Higher Education Quality Committee (2008) audit of the University of the Western Cape, highlighted a shortcoming of the University of the Western Cape Institutional Operating Plan (2009), in that the characteristics of a UWC graduate were not embedded within programmes, and were therefore not included as educational outcomes and assessed accordingly. As a response to this audit report, the institution developed the Charter of Graduate Attributes, highlighting what it is, beyond discipline-specific outcomes, that a UWC graduate should be. However, since the charter is a relatively new document, few departments at the institution have gone further than incorporating the attributes into their administrative documents, and little is known about how to use the curriculum to best develop these characteristics in students. If the implementation and assessment of graduate attributes is to move forward in the institution, we need to better understand how we can change teaching and learning practices in ways that facilitate the development of these attributes in students at UWC.

In 2010, UWC began a comprehensive programme to cultivate a scholarship of teaching

and learning across the institution, recognising it as an essential aspect of academic work. When the institution published its teaching and learning policy document, the physiotherapy department began a process of curriculum review and reform, creating its own Teaching and Learning Implementation policy, aligned with the institutional goals. The Mission Statement of the department was revised in 2010, and currently states that:

The Physiotherapy Department at the University of the Western Cape recognises a Scholarship of Teaching and Learning that leads to the development of self-directed and lifelong learners using sound pedagogical principles that place the student at the centre of the process. It strives to provide an environment in which students and staff can take the initiative in terms of their own personal and professional development, to build their confidence and to prepare them for a career in which they are able to participate according to the full spectrum of their abilities. It recognises the importance of understanding the needs of the national health service, the profession, the institution and the students, and seeks to guide a process that will lead to a physiotherapy graduate who is reflective, socially aware, collaborative and effective.



The Department of Physiotherapy at UWC offers a four year undergraduate degree, accepting between 50 and 60 students every year, with about 200 students distributed across the four year programme. Students spend much of their first two years on campus, developing their knowledge and skills in preparation for the clinical environment. The third and fourth year of study are spent mainly on clinical rotations, where they are exposed to clinical practice, working among clinicians and peers from other institutions.

This research project arose in part because of an institutional and departmental drive to review teaching and learning practices, as well as recognising the need to improve clinical reasoning following feedback from clinicians, clinical supervisors and external examiners.

2.5. Population and sampling

The target population for this study varied depending on the phase of the study, and although the the intervention was implemented in the second year class during 2012, other

aspects of the project were conducted among other groups of students in the years leading up to this intervention. The different populations and samples for the different projects are described more completely in each chapter, so this section merely provides an overview.

During the preliminary phase of the study (Chapter Four) a convenient sample of all registered undergraduate physiotherapy students (n=131) for the 2010 academic year helped to determine how students in this department used technology as part of their learning. The questionnaire for this survey was piloted on the second year class (n=31) in order to test the reliability of the instrument, and they were therefore excluded from the final sample.

The next phase of the study included four smaller projects that were conducted as part of the development of the intervention. The survey presented in Chapter Six included all final year undergraduate physiotherapy students in the same department (n=46), who were registered for the Applied Physiotherapy module (PHT403) during 2009. These students were conveniently selected as they were taking the module that the researcher was teaching. The study described in Chapter Seven was conducted among all third and fourth year students (n=70) in the department during 2010. These students were purposively selected as they were on their clinical rotations at the time, and the study was evaluating the use of a social network to facilitate clinical and ethical reasoning. The Delphi study in Chapter Eight was conducted in 2011 among three panels of South African and international experts in the domains of clinical practice, clinical education and educational technology. The panel members are described in more detail in the chapter.

The sample for the intervention phase of this study included second year physiotherapy students registered for the 2012 academic year. This group was purposively selected as it was felt that first year students had not been exposed to enough clinical aspects of education, and third and fourth year students had been in the traditional system for too long to implement radical changes in their curriculum. The researcher asked all registered second year students who participated in the intervention (n=61) if they were prepared to participate in a focus group, and 22 responded positively. Twelve students were purposively selected and invited to participate, selected from both high and low ends of

scales that measuring their age, levels of online participation and their average marks in the module, in order to include as diverse a sample as possible.

2.6. Data collection methods and tools

This section describes the various methods of collecting data that were used during the course of the project. Since each of the following chapters presents the results of a different study, data collection and analyses of those studies is only briefly described here, with further details and supporting evidence presented in each of the relevant chapters.

Chapter Three: A systematic review of the literature

A review protocol was developed following the formulation of a specific, targeted research question that identified the population, intervention and outcomes that the review would evaluate. The population included allied health, medical or nursing students and the intervention was the implementation of a blended learning strategy in clinical education. The outcome measure was any change in the components of clinical education that had been identified in the preliminary literature review. The methodological quality of studies was determined independently by two reviewers using quantitative, qualitative and mixed method critical appraisal tools to exclude poor quality studies. These tools were used to score the pool of articles in order to determine which studies to include in the review. Finally, a self-developed data extraction form was used to extract the data from the studies, using criteria that were determined prior to the data extraction. Data were then analysed using a narrative format according to pre-determined themes that had emerged from the preliminary literature review. The themes included the design of the study, presence of a control group, description of the sample and intervention, and the clinical competencies and results.

Chapter Four: A survey of students

A cross-sectional, descriptive design was used to obtain both quantitative and qualitative data by means of a survey that used a questionnaire with closed- and open-ended questions. The questionnaire was developed using the study objectives and a review of relevant literature. Closed-ended questions included Yes / No responses and a visual analogue and five point Likert scale. These were used to identify participants' learning preferences and their comfort when engaging in online activities. Open-ended questions

were used to provide context and depth to the closed-ended responses. The questionnaire made use of five categories, including; Internet access, Use of online tools, Learning preferences, Attitudes towards teaching practices, and Demographic information. A pilot study was conducted using test-retest analysis with a one week gap found that the instrument was reliable. In addition, student feedback and analysis of the results in the pilot led to improvement of the instrument by removing ambiguity and standardising terminology. Finally, consultation with two experienced researchers in the field of healthcare education was used to improve face and content validity.

Chapter Five: A narrative review of the literature

Chapter Five made use of a narrative literature review to explore the range of potential theoretical frameworks and teaching methods that would inform the development of the intervention. Preliminary reading during the course of the study had highlighted the main themes and authors who might make conceptual contributions to the project. These papers were identified using keyword searches, selected on the basis of their abstracts, and analysed in terms of the article content. Since this was a narrative review, no specific review protocol was developed, and no method described in the chapter. However, the aim and rationale for the review is presented in Chapter Five.

Chapter Six: A survey of students

This descriptive survey made use of a self-developed, self-administered questionnaire that was distributed to all students in the physiotherapy department following completion of a learning task that integrated technology into the activity. The questionnaire used open- and closed-ended questions to determine students' experiences and perceptions of using a wiki to work together in small groups. Survey responses were captured using OpenOffice.org Calc. Responses to closed-ended questions were analysed using frequencies and descriptive statistics. The responses to open-ended questions were analysed qualitatively according to pre-determined themes that were based on the intervention that was implemented in the module. This content analysis was conducted by two researchers to avoid bias, until consensus was reached.

Chapter Seven: Content analysis of student work

This study analysed the content of student work that was generated as they completed a

learning task for one of the modules in the programme. Students created reflective blog posts as part of their clinical practice and professional ethics assignments. The text from these reflections were exported and analysed qualitatively to examine student-teacher, student-student, and teacher-student interactions, using the theory of assisted performance to create pre-determined themes for the analysis.

Chapter Eight: A Delphi study of three expert panels

A Delphi study is used to gather data from domain experts with the intention of coming to consensus, often around poorly defined topics, such as developing alternative approaches to various programmes or systems. Since this method has been used in various studies in the clinical and teaching context, it was felt that it was an appropriate method to gather data for this study. However, this project used a modified version of the traditional Delphi, in which a different panel of experts was consulted in each round, in order to gain insight into the different challenges that are present in this context.

The questions for the first round were based on a review of the relevant literature, with those for each subsequent round being derived from the previous responses. While a traditional Delphi study only uses open-ended questions in the first round, this study used them in each of the three rounds. In addition, reaching consensus was not the objective of the study, so the statistical analyses for rating participant responses was excluded, with the responses from each round being analysed qualitatively. Inductive analysis was used in order to determine themes that emerged from the data, rather than using pre-determined themes. Words and phrases were highlighted as being similar or belonging to the same categories, which were then used to determine the themes.

Chapter Ten: Content analysis of student focus groups

Focus groups were conducted among selected groups of student participants, as this approach allows the development of ideas and themes collaboratively, and which may not have arisen with individual interviews or surveys. The transcripts from focus groups were analysed inductively to determine themes that emerged from participant responses. Inductive analysis was appropriate as there is currently no evidence of any similar previous studies in clinical education. Words and phrases with similar meanings were

identified, coded and organised into categories that best represented the emergent themes. The themes were analysed and discussed by the researcher and a supervisor, and then independently reviewed by another supervisor, in order to reduce the potential for bias.

2.7. Procedure

While design research has been shown to be an effective method for conducting research in higher education, it is noted that assessing these projects can be challenging because there is no canonical method for the approach (McKenney & Reeves, 2012). There are shared characteristics however, that can assist in the development of sound design research projects, which are presented below. The process of conducting design research can be completed in four phases that structure the research project (Herrington, Reeves, & Oliver, 2010). Each of the four phases consists of several key aspects, which were mapped to a specific objective as part of this study (McKenney & Reeves, 2012).

a) Phase 1: Analysis of practical problems by researchers and practitioners

By the end of this phase, there should be a clear description of the problem in the educational context, a review of the literature, a summary of practitioner's views, and preliminary research questions. There are three key areas to consider in this phase.

1. Identification of the problem by both researchers and practitioners. Many researchers begin with a solution to the problem by choosing the technology that will be used before considering the problem it will solve. Design research begins with an assumption that existing practices are inadequate, or can be improved. This aspect of the first phase was addressed in Chapter One, which consisted of a narrative review of the literature that identified the project background, major concepts involved, the main problem that the study will address, and the significance of the research.

2. A literature review is conducted. This is done in order to establish the context of work that has already been done by other researchers, together with identifying how similar problems may have been addressed. This was done by conducting a systematic review of the literature, looking at what others have contributed in terms of blended approaches in

clinical education. This aspect of the study is described in Chapter Three.

3. Practitioners must be involved, together with researchers, as they explore the nature of the problem. This prevents the problem from being interpreted solely from the researcher's point of view. In order to get a better understanding of the learning environment in the department, a survey of students was completed, in order to determine how they currently use technology, both socially and as part of their learning practices. A questionnaire developed by the researcher was used to conduct the survey, which was administered to all registered students in three of the undergraduate classes when they were on campus, taking into account the clinical rotations of the students. The 4th year students were surveyed during the second term, while the 1st and 3rd year surveys were completed in the third term. The researcher was present during the surveys in order to address any questions that might arise. Data were captured using double entry to ensure consistency and accuracy, and was analysed descriptively. These results are presented in Chapter Four.

b) Phase 2: Development of solutions to the problem identified

By the end of this phase, draft design principles will have been produced, informed by existing design principles and technological innovations. The appropriate technologies for the intervention will be selected, and the solution to the problem planned and created. There are three key features of this phase.

1. Draft design principles from the literature. The literature is reviewed again, to identify relevant theory to guide thinking, as well as find existing design principles that may have addressed similar problems. This review is more than locating the research within a domain-specific or theoretical context; it serves to facilitate the creation of draft design guidelines for the intervention. I conducted another narrative review of the literature, this time with a more specific focus on identifying appropriate theoretical foundations for the study. I explored design principles from other fields in order to find approaches to technology-integrated teaching and learning practices that I could use to inform my implementation. This results of this review of the literature is presented in Chapter Five.

2. Consider how best to operationalise the intervention in an e-learning environment, using

appropriate technologies. Throughout the process of gathering evidence during this phase, I referred back to the draft design principles, adding, modifying and deleting where necessary. This aspect of the process was addressed by conducting three separate studies.

The first study surveyed fourth year students after an intervention that included collaborative content creation by small groups of students as part of an assignment. Historically the module was taught using a lecture format, with assignments being a variation of either individual evidence-based essays or a group-based presentation. For the purpose of this study, a wiki-based assignment was designed, guided by social constructivist principles. Students were required to gather information related to the assessment, treatment and management of common conditions in paediatric patients. Students were randomly split into small groups of six members, with each group having to create pages within the wiki as part of their assignment, as well as review the work of other groups. Students were prepared by providing them with a slide presentation demonstrating a step-by-step version of the wiki editing process, watching a video highlighting the features of the wiki, and giving them a handout explaining how to access and edit the wiki. A Help section was also created within the wiki, linking to additional information around formatting, embedding multimedia and referencing within the online platform.

The second study in this phase used content analysis of student interactions in an online social network. The network was only accessible by the the staff and students within the department, and was therefore not indexed by search engines. Students and staff within the department were registered as users on the network and participated in a workshop to familiarise themselves with the relevant features of the social networking platform. During the workshop, the students were given assignments that were constructively aligned with the module outcomes of their clinical practice and professional ethics modules. Students were required to write two reflective posts on their experiences and ethical dilemmas that emerged during their clinical rotations. All students were required to read and comment on the posts of others within their year level, and were also expected to link to additional media and external sources in order to support their claims and statements. The lecturer took the role of facilitator and read through students' posts, regularly providing comments, suggestions and questions to try and guide students' reflective engagement with their

experiences.

The third study in this phase used a modified Delphi method to gather input from three expert panels. The panels for the study were purposively selected from within the researcher's personal and professional networks of practice, and included both South African and international experts. Three rounds of surveys ran from October, 2011 to February, 2012. Questionnaires were sent to participants by email, or they were able to complete each round using an online, web-based survey. Reminders were sent out two weeks after the initial surveys were emailed. Round one was sent out in October and the results were analysed in November. These results led to the development of the second round survey, which was sent in December. The results of the second round were analysed early in January, and led to the development of the third survey, which was sent in late January. These final results were analysed in February, 2012.

3. *Design the learning environment.* How will each design principle be reflected in practice in the learning environment? Chapter Nine describes how the first set of draft design principles were used to create and implement the blended approach.

c) Phase 3: Iterative cycles of testing and refinement of solutions

First implementation cycle. This first iteration is planned in the same way as any other research study, in the sense that participants, data collection and method of analysis are selected relative to the research question. Data may be collected over weeks, months or years. While quantitative and / or qualitative methods may be used, design research does not emphasise isolated results, and should take into account input gathered from multiple sources over a period of time. A broad range of indicators of success should be gathered, with the intention to triangulate data in order to demonstrate successful outcomes.

I addressed this final aspect of the third phase by implementing the blended learning module during the first semester of 2012, which is described in Chapter Nine. During this process, I gathered data in the form of informal student and staff feedback, focus groups, the minutes of meetings, my own reflections, online polls, student work, activity logs and content analysis. These informal results are presented with limited analysis in Chapter Nine, as part of the modifications to the draft guidelines.

At the end of the semester, I conducted focus groups with two sets of students, the results of which are presented in Chapter Ten. Focus groups were held at the end of the first semester in 2012, including the researcher and two groups of six students. Each session began with an explanation of the purpose and procedure of the discussion, the topics of which were based on the changes made to the module. The discussions were recorded and the audio files sent for independent transcription, and then sent to participants for verification.

The final set of draft guidelines is presented in Chapter Eleven, the conclusion of the study. It should be noted that at this point, these guidelines should still only be considered to be a draft after one iteration of the intervention. In order to fully develop the guidelines, the process should be repeated for successive cycles, as a single iteration is often not sufficient to gather enough evidence of the success of the intervention. A typical design research study would have two or more cycles. The purpose of this research is developmental in nature, and should aim to improve the intervention, rather than prove its success (Reeves, 2003). Evidence gathered during the first cycle will be used to refine the approach and continually improve it, rather than viewing it as a once-off test of effectiveness.

d) Phase 4: Reflection to produce design principles and enhance solutions

The last phase is to reflect on the entire process in order to produce design principles that can inform future development and implementation. There are three key features of this phase.

1. Design principles. This is what sets design research apart from action research i.e. the production of principles that advance both the theoretical and practical understanding of the problem. After implementing and evaluating the intervention, the draft design principles are reviewed in light of the outcomes of the intervention. They may need to be refined, revised, reorganised, combined, reduced, and possibly added to. The final set of guidelines are not presented as part of this project, since only one iteration of the intervention has been completed.

2. *Practical output of design research.* The product of the design is viewed as a major output that can be shared or published. In the case of this study, the output will be a set of design principles that can be used for future curriculum development in this department.

3. *Societal output of design research.* The intense collaboration that is essential to the process leads to professional development of everyone involved, not only the students. Whereas previous educational technology research has usually involved one teacher in a single department, design research requires the collaboration of teachers, students, administrators in order to achieve the learning objectives. In other words, staff development is a key feature of design research. In addition, the process should lead to a set of publications or conference presentations that aim to disseminate the findings of the design research process. While there was evidence of staff development during this process, it was not formally evaluated as part of this study, and therefore not included in these results.

At the heart of design research, is the fact that practice is informed by theory, and the creation of design principles and guidelines that enables research outcomes to be transformed into educational practice. Most qualitative research aimed at studying educational technology makes no claims of generalisability, and quantitative or experimental research cannot address the complex problems involved in promoting student learning (Reeves, Herrington, & Oliver, 2005). Design research aims to develop theories that actually work in terms of solving educational problems that exist in the real world. The generation of theories, design principles and guidelines enables research outcomes to be transformed into educational practice, and of deeply understanding how the integration of technology can be used to implement inquiry-based learning (McKenney & Reeves, 2012).

The illustration on the next page is a graphical representation of the procedure of the study, using the phases of design research to provide structure. The numbers in parentheses highlight which chapter that aspect of the study is addressed in.

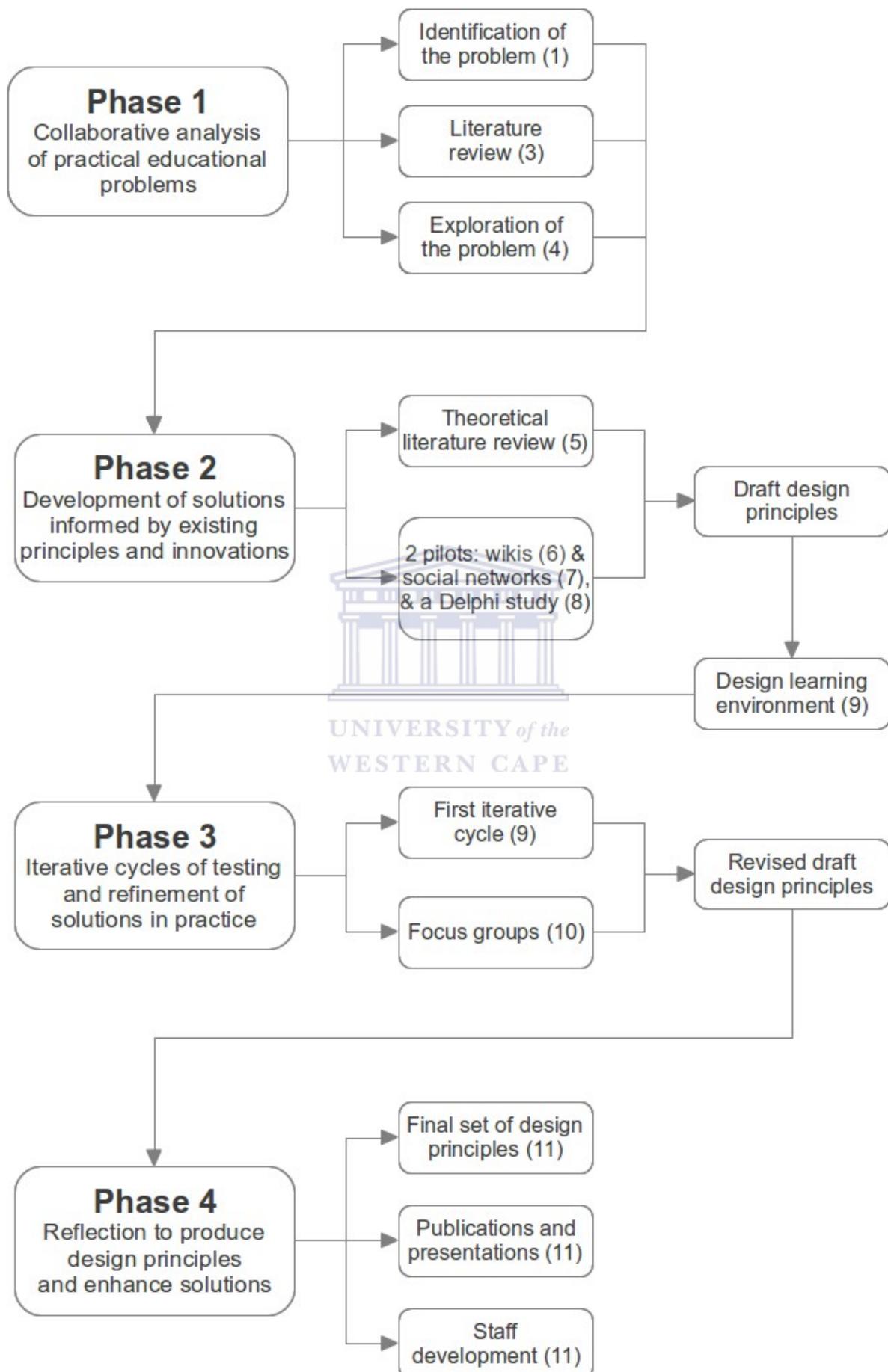


Illustration 2.2: Design research framework for the study.

2.8. Ethical considerations

This research project received ethical clearance from the University of the Western Cape Research Grants and Study Leave Committee (project registration number: 09/8/16), and permission to conduct the survey was obtained from the Head of Department. All participants were informed of the research process at the outset of the project, and kept up-to-date at every major stage. Questionnaires for surveys were accompanied by an information sheet explaining the background and reason for conducting the survey, and students gave written, informed consent following an opportunity to clarify the study details (See Appendix I).

Although students were required to participate in various learning tasks as part of the continuous assessment of the modules, they did not have to participate in the research that took place afterwards. In other words, students had to complete the tasks for the modules, but could have the data generated by those tasks removed prior to analysis. Participation in the various studies was voluntary and students were informed that they could withdraw at any time with no negative consequences. Anonymity of participants was insured by not gathering personally identifiable information and all data was kept confidential and secure.

Participant responses were anonymised before analysis, and in cases where screenshots of online activity were taken, only usernames, avatars or first names are visible. These have been left intact in most cases to contextualise the online space. Participants could have their data removed from the study at any time, even after it had been analysed. For the focus groups, participants were informed that while participant anonymity was required, they could discuss the content of the focus group with others. Transcripts were anonymised on return from the transcriber, prior to being sent to participants for verification. No students asked for their interactions to be removed prior to the start of the research.

The students were informed during the first week of the semester that various aspects of this module would be studied as part of a research project, and that their case notes, reflective blogs, online and classroom interactions, clinical files and discussions with facilitators might form part of the data gathered. All students signed informed consent

forms at the beginning of the module, which stated that they had received enough information to enable them to make decisions about whether they wanted their work used as part of the research. Students and staff were informed that, while they were required to participate in the learning activities and assessment tasks as part of the module, they could ask to have that content withdrawn from the study at any time, with no negative consequences. These principles were reiterated during the focus groups, surveys and any other time that information was gathered.



2.9. Conclusion

Chapter Two explored the different research methods that were considered and used during the course of this study. Three overarching research designs were discussed, including action research, developmental evaluation and design research. While each of these methods was considered to have value in the general process, only design research had a structured approach that placed pedagogy first, was informed by theoretical frameworks, and aimed to derive design guidelines that could be used for future curriculum development. However, the principles of both action research and developmental evaluation were influential in the design and implementation process.

The phases of design research were described in detail, with each phase describing the procedure used to carry out a smaller study that aimed to create and refine a set of draft design principles that clinical educators could use to develop capability in physiotherapy students. The first phase of the method used in this research project described the practical and theoretical problems faced by clinical educators, through a narrative literature review that was presented in Chapter One. This phase also includes a systematic review of the literature to explore the role of blended learning to develop competencies as part of clinical education, which is presented in Chapter Three. Finally, a survey of physiotherapy students served to gather input from relevant stakeholders to further explore the nature of the problem identified, and is presented in Chapter Four.

Phase Two described four methods that were used to begin developing potential solutions to the problems described in Chapter One, culminating in the development of a set of draft design principles. A narrative literature review was used to explore theoretical frameworks that could inform the development of the blended intervention. Two pilot studies were then described, each of which was used to evaluate different aspects of a blended approach to clinical education. Finally, a Delphi study was presented that aimed to finalise the first full draft of the design principles. These four studies are presented in Chapters Five, Six, Seven and Eight.

Phase Three includes the development and first iteration of the blended learning module in the curriculum, resulting in further refinement of the design principles. This phase is

described in Chapters Nine and Ten. Phase Four of the design research process is only covered briefly in this study, as it involves successive iterations of the intervention in the future. However, Chapter Eleven presents preliminary evidence supporting the use of these design principles to create learning environments that present opportunities for the development of capability in physiotherapy students.

The next chapter describes the outcome of a systematic review of the literature, and represents the first aspect of Phase One in the design research process.



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3. Chapter Three: Blended learning in clinical education

It gave a tremendous level of self-confidence, that through exploration and learning one could understand seemingly very complex things in one's environment.

Steve Jobs (1995)

3.1. Introduction

Chapter Three describes the beginning of the first phase in the design research process. This phase aims to present an analysis of the educational problem that the study aims to address. In the context of this research project, the problem in question is the development of capability in undergraduate physiotherapy students, and the numerous challenges involved in this process. Some of the background literature was presented in Chapter One, which dealt with complexity in clinical practice and clinical education, changing perspectives in higher education in general, the role of technology in changing teaching and learning practices, and the challenges inherent in each of these major areas. Chapter One also identified the main aim and objectives of the study, as well as the research questions that will be answered at each stage of the process.

This chapter presents the results of a systematic review of the literature that aimed to assess the impact of blending learning on healthcare students' clinical competencies, as well as situating this study within an international context. This chapter also answers the question: How can blended learning be used to develop healthcare students' clinical competencies as part of clinical education?

The next section of this chapter has been published as:⁶

Rowe, M., Frantz, J., & Bozalek, V. (2012). The role of blended learning in clinical education: a systematic review. *Medical Teacher*, 34(4), e216-e221.

M.R. was responsible for substantial contributions to the conception and design of the project, the acquisition of data, and analysis and interpretation of the results.

⁶ Communication between the researcher and reviewers is presented in Appendix IV.

J.F. And V.B. contributed to analysis and interpretation of results.

M.R. was responsible for drafting the article from conception to the final, submitted version.

J.F. And V.B. were responsible for the final approval of the version to be published, and for critical reading of the paper.



3.2. Blended learning in clinical education: A systematic review

Abstract

Background: Developing practice knowledge in healthcare is a complex process that is difficult to teach. Clinical education exposes students to authentic learning situations, but students also need epistemological access to tacit knowledge and clinical reasoning skills in order to interpret clinical problems. Blended learning offers opportunities for the complexity of learning by integrating face-to-face and online interaction. However, little is known about its use in clinical education.

Aim: To determine the impact of blended learning in the clinical education of healthcare students.

Methods: Articles published between 2000 and 2010 were retrieved from online and print sources, and included multiple search methodologies. Search terms were derived following a preliminary review of relevant literature.

Results: Seventy one articles were retrieved and 57 were removed after two rounds of analysis. Further methodological appraisals excluded another seven, leaving seven for the review. All studies reviewed evaluated the use of a blended learning intervention in a clinical context, although each intervention was different. Three studies included a control group, and two were qualitative in nature. Blended learning was shown to help bridge the gap between theory and practice and to improve a range of selected clinical competencies among students.

Conclusion: Few high-quality studies were found to evaluate the role of blended learning in clinical education, and those that were found provide only rudimentary evidence that integrating technology-enhanced teaching with traditional approaches has potential to improve clinical competencies among health students. Further well-designed research into the use of blended learning in clinical education is therefore needed before we rush to adopt it.

Keywords: blended learning, clinical education, clinical skills, learning outcomes, technology, teaching and learning

a) Background

Clinical education is an important component of any healthcare curriculum, with exposure to patients in clinical settings creating an environment for clinical practice that cannot be replicated in a classroom (Baldry-Currens & Bithel, 2000). However, clinical practice is also challenging as the healthcare practitioner must review and re-prioritise poorly defined clinical problems in an enterprise of active interpretation during the management of the patient. In addition, this tacit understanding of practice knowledge is often contextualised within the language and norms of the profession and can therefore be obscured to the undergraduate student (Higgs, Richardson & Dahlgren, 2004). Another challenge in the domain of clinical education is the difficulty in providing student support that facilitates the development of clinical reasoning skills (Tan, Ladyshevsky & Gardner, 2010). It has been suggested that clinical practice can be developed through sharing knowledge and experiences within a collegial environment. This enables external knowledge to be internalized, develops problem-solving strategies and promotes critical reflective thinking by challenging unshared biases and presuppositions (Hanko, 1999; Jacques, 1991; Mason, 1998).

Today's healthcare graduates must not only possess the technical skills necessary to practice, but must also be proficient in other competencies that impact on their professional practice. This includes an awareness of their own attitudes, values, and responses to health and illness. In addition, they must also be able to educate others effectively, critically evaluate their own professional practice and have good communication skills. Other competencies include clinical reasoning and an ability to articulate the rationale behind patient management (Higgs et al., 1991). If the development of these competencies is to be effective, clinical education needs to facilitate ongoing reflective practice which could be used by students who become health professionals for their ongoing lifelong learning. In addition, educators should seek to establish “mutually beneficial” relationships with students, and place a greater emphasis on the relationship between theory and practice (Strohschein, May & Hagler, 2002).

Although the importance of clinical education is widely acknowledged as being important, there is a lack of evidence for evaluating its process, as well as about the effects of new models or approaches. Many models of clinical education currently exist, including

mentoring, collaborative, shared responsibility, combined collaborative and peer tutoring.⁷ Currently, no model of clinical education is superior to any other and studies that did recommend one approach to another were not methodologically strong (Lekkas et al., 2007). In order to better understand the process and outcomes of clinical education there is a need for research that evaluates the relationships between educators and students, the variability of the process and the role of reflection within the clinical setting (Stroschein, May & Hagler, 2002). Any approach to teaching clinical practice must therefore take into account its complex and varied needs. A blended approach to clinical education may have the affordances to address some of this complexity and variation.

Blended learning refers to the systematic integration of online and face-to-face engagement to support and enhance meaningful interaction between students, teachers and resources (Garrison & Kanuka, 2004). Using principles of adult education, blended learning allows for greater flexibility and responsiveness in the teaching and learning process (Lewin et al., 2009). In addition, the integration of online teaching has been shown to overcome the limitations of time and space, support teaching methods that are hard to achieve using textbooks and reach a larger number of students without increasing resource requirements (Gray & Tobin, 2010). The integration of technology into pedagogy has the potential to facilitate flexible, learner-centred teaching, encourage interaction among students and staff and enable them to collaborate and communicate asynchronously (Ellaway & Masters, 2008).

It is important to note however, that blended learning is highly context-dependent and that the generalisation of concepts across disciplines is challenging (Harris, Connolly & Feeney, 2009). Thus, a successful implementation of blended learning in one domain does not necessarily mean that it will have value within another domain. Although blended learning makes use of computers and the internet, it should be remembered that the focus should not be on the technology. Rather, the educator must first determine the best way to teach a particular topic and then determine how technology might enhance the teaching (Laurillard, 2002). Furthermore, while an innovative approach to clinical teaching may be effective, it also requires a cultural change in teaching practice, which has implications for its effective implementation (Gray & Tobin, 2010). The aim of this systematic review was

⁷ For additional explanation of each of these approaches, see Lekkas et al. 2007 and Stroschein et al. 2002

therefore to determine whether a blended approach to teaching and learning in clinical education has the potential to enhance the clinical competencies of healthcare students.

b) Review question

A specific, targeted review question was formulated identifying the population, intervention and outcomes that the review would evaluate. The population included allied health, medical or nursing students and the intervention was the implementation of a blended learning strategy in clinical education. The outcome measure was any change in the components of clinical education that had been identified in the preliminary literature review (Khan, Kunz, Kleijnen & Antes, 2003). These included reflective practice, lifelong learning, mutually beneficial relationships, enhancement of the clinical experience, application of theory to practice, teamwork, self-appraisal skills, or a re-framing of existing knowledge with a subsequent impact on practice.

Review question: What is the impact of a blended learning approach on healthcare students' clinical competencies as part of clinical education?

c) Method

Inclusion criteria

The search parameters included full-text articles published in English between 2000 and 2010 and incorporated studies that both supported and did not support the use of blended learning, in order to reduce publication bias. It included cohort and case studies which used quantitative, qualitative and mixed methods. Search terms were chosen after a preliminary review of relevant literature yielded commonly used words and phrases, which were finalised after consultation with an experienced researcher and clinical educator (Table 3.1 below).

Table 3.1: Key search terms and related synonyms

Educational field	Approach to teaching and learning
Clinical education	Blended learning
Medical education	Computer-aided teaching
Nursing education	Computer-aided learning
Health education	Integrated learning
	Hybrid learning
	Multi-method learning

The search was conducted in three parts. Initially publications were retrieved from selected electronic databases (Academic Search Premier, CINAHL and MEDLINE), print journals (via JSTOR) and published conference proceedings. When available, the “related research” option within each database was consulted. The next search made use of Google, Google Scholar and Mendeley, a socially constructed research database, in order to identify relevant articles that existed outside of the previously identified databases. The last stage included scrutiny of the reference lists of the collected articles in order to identify additional studies that fit the inclusion criteria. When the titles of the articles were not sufficiently descriptive to make a decision, the abstracts were consulted.

The preliminary review indicated that many studies were conducted on cohorts of students via surveys that used quantitative, qualitative and mixed methods, as well as individual case studies. Once all articles had been collected, the first author conducted an initial screening to ensure that only relevant studies were included in the critical appraisal. Then, a second screening was conducted with the second author with the same objective. The methodological quality of studies was determined independently by the two reviewers using quantitative, qualitative and mixed method critical appraisal tools to exclude poor quality studies. Finally, a self-developed data extraction form was used to extract the data from the studies, using criteria that were determined prior to the data extraction.

Data were analysed using a narrative format according to pre-determined themes that had emerged from the preliminary literature review. The themes included the design of the study, presence of a control group, description of the sample and intervention, and the clinical competencies and results.

d) Results

Seventy-one articles were retrieved during the keyword search. The first round of screening by the first author excluded 47 studies on the basis of not meeting the inclusion criteria and student learning outcomes identified in the preliminary literature search. Another round of screening with the second author excluded an additional ten studies on the same basis. Thus, 57 articles were excluded during two rounds of analysis, the reasons for which are presented in Table 3.2 below.

Table 3.2: Reasons for excluding retrieved studies during the initial analysis (n=57)

No.	Reason for exclusion
24	Blended learning was used in healthcare education, but not in a clinical setting
26	Intervention was described as blended learning or an appropriate synonym, but was not a true blend i.e. the intervention was not integrated with clinical activities
7	Study discussed or mentioned blended learning but was evaluating something else

This left a total of 14 studies that were eligible for the critical appraisal of methodological quality by the author and second reviewer, of which seven were excluded. These are presented in Table 3.3 below.

Table 3.3: Reasons for excluding studies based on methodological quality (n=7)

No.	Reason for exclusion
3	Outcome measures not identified, poorly described or not valid / reliable
1	Limited literature review and/or background
3	Sample poorly described
4	Study design, intervention or methodology was not clear
1	Conclusions not supported by results

Note: certain studies were excluded for multiple reasons, which is why the total is higher than 7

Table 3.4 (below) presents the final seven studies that were selected for the review, following the critical appraisal.

Table 3.4: Data extraction from selected articles (n=7)

Study	Control	Sample and duration	Intervention and evaluation	Competencies (study aims) and results
Carbonaro et al., 2008	Yes, BL* and F2F*	Medical, Dental, Dental Hygiene, Medical Laboratory Science, Nursing, Nutrition, Occupational Therapy, Pharmacy, Physical Therapy students. 23 students in “blended” group, 28 students in F2F group Country: Canada Duration: n.d.	Intervention: Blended synchronous (VoIP*, Elluminate) / asynchronous interaction using (interactive whiteboard, IM, voice) & WebCT (course and content management). Evaluation: Pre- and post intervention, using a survey among volunteers.	Competencies: Interprofessional team process skills (knowledge, skills, attitudes), team dynamics, team decision-making, conflict resolution, reflection. Result: No significant difference between BL* and F2F* groups.
Cooner, 2010	No	81 social work students Country: United Kingdom Duration: Sep. 2007 - Mar. 2008	Intervention: Online lectures delivered via WebCT, along with links to further resources, video case studies, small group discussion, online and hardcopy workbook. Evaluation: 1) survey and 2) focus group discussions with 2 randomly selected groups of 9 people.	Competencies: Development of reflective skills. Result: No difference in marks compared to previous years, but presentations demonstrated better reflective analysis and deeper theoretical understanding.
Davies et al., 2005	No	88 physical therapy students Country: United Kingdom Duration: Jan. - Mar. 2002	Intervention: Lecture session initially with video and small group discussion, then IT* practical sessions, access to video on CD, which were linked to WebCT and had MCQ* for individual formative assessment. Summative assessment also online.	Competencies: Develop neurological observational skills, which aspects had helped prepare / hinder them in preparation for clinical placement. Result: The combination of traditional group-based activities,

Study	Control	Sample and duration	Intervention and evaluation	Competencies (study aims) and results
			Evaluation: Focus groups and open-ended, semi-structured interviews.	practical sessions and computer-based tools helped students to bridge the gap between theory and practice.
Gordon et al., 2005	No (self control with pre-test)	73 randomly selected paramedics from local municipalities, attending classes on stroke education and clinical competencies. Country: United States Duration: Jan. - Oct. 2000	Intervention: Lectures and interactive teaching (small group discussion / practical sessions), then video case scenarios and review instructors, final evaluation in game show format. Evaluation: Pre- and post intervention, using a MCQ* questionnaire.	Competencies: Case scenarios to evaluate knowledge of stroke, skills evaluation, history taking, neurological examinations, communication skills. Result: Led to improved knowledge and clinical competencies such as history taking, patient examination, reporting and patient management.
Lewin et al., 2009	Yes	41 medical students and 9 in the control group Country: United States Duration: Jan. 2002 - Jul. 2005	Intervention: 4 interactive online modules that augmented clinical learning. The online environment allowed students to interact with virtual patients and objects e.g. SOAP* notes, medical folders, patient handouts. Evaluation: Post intervention survey using Likert scales and free text responses.	Competencies: Documentation skills, complex patient interactions, case studies, and patient education. Result: Students better understood relationship between theory and practice in real world clinical scenarios.
Sung et al., 2008	Yes (BL* with e-learning component and F2F* lectures)	26 nursing students in the blended learning group, and 24 in the F2F* group Country: Korea	Intervention: Web-based e-learning programme that included components on clinical cases, medication administration and relevant content.	Competencies: Self-efficacy, medication administration and knowledge of medication. Result: Knowledge and

Study	Control	Sample and duration	Intervention and evaluation	Competencies (study aims) and results
	only)	Duration: 21 Feb. 2004 - 23 Nov. 2004	Evaluation: Pre- and post-test (1 immediate and 1 after 6 months).	self-efficacy improved more in the BL* group.
Tan et al., 2010	No	8 groups of 9-10 final year physiotherapy students. 83 students participated in the blogging assignment, 45 students had their posts coded and evaluated Country: Australia Duration: Feb. - Dec. (no year)	Intervention: All students allocated to blogging groups, workshops, handouts re. blogging. Each student had to write one original reflection per week, and to comment on 2 other reflections per week. Evaluation: Qualitative study using reflective blog posts as primary data.	Competencies: Clinical reasoning during clinical placements. Result: Blogging is a viable tool to facilitate clinical reasoning and metacognition through peer learning strategies while on clinical placement.

* Abbreviations used in the table: BL = blended learning; F2F = face-to-face; IT = Information Technology; MCQ = multiple choice questions; SOAP = Subjective, Objective, Action, Plan notes; VoIP = Voice over Internet Protocol (e.g. Skype)

Of the seven studies described in Table 3.4 above, only two contained details of the ethical considerations of the study.

e) Discussion

Sample

The samples consisted of healthcare students across a range of disciplines, including physiotherapy, medicine, nursing, social work, occupational therapy, pharmacy, and paramedics. Thus, the results of these studies indicate that blended learning has been explored across many disciplines in healthcare, which may have implications for healthcare educators looking to integrate technology into their teaching practices. Sample sizes were small throughout, ranging from 51 to 88 participants, making generalisation of results across different domains challenging, if not impossible. While these numbers are low, it would be difficult to increase the samples by any substantial figure, since most of the interventions were implemented among single classes of students within single institutions.

Location

The studies were conducted in the United Kingdom (2), the United States (2), Canada (1), Australia (1) and South Korea (1). Students in these developed nations could generally be expected to have access to the necessary technical infrastructure that makes blended learning a feasible option. However, as was highlighted earlier, blended learning is highly context dependent (Harris, Connolly & Feeney, 2010), making it difficult to generalise results between populations and geographical location. The lack of evidence of a blended approach to clinical education in developing countries may be an indicator of some of the challenges associated with technological innovation in areas with poor infrastructure. Indeed, epistemological and physical access to technology has been highlighted as a major challenge in the implementation of technology-enhanced teaching and learning practice in developing countries (Czerniewicz & Brown, 2005).

Study design and evaluation of interventions

A range of study designs were used, with and without control groups, indicating a variety of methods to determine the efficacy of the blended learning approach. These included quantitative, qualitative and mixed research methods that sought to identify which of the clinical competencies had been met. Again the variety of methods used indicate the

prominence of context in determining how interventions were implemented and evaluated. While three of the studies in this review included comparative evaluation with a control group, it has been suggested that evaluating the effectiveness of blended learning must go beyond a mere comparison with traditional approaches. Instead, research into blended learning should focus rather on exploring different blends of effective approaches, tools and technologies (Ayaia, 2009). In this sense, current studies may be emphasising the wrong aspects of blended learning. Instead of using computers in a more traditional approach, educators may need to shift their focus towards redesigning curricula to take advantage of technology-enhanced teaching and learning. The diversity in scope of blended learning interventions further emphasises the challenges of research in this area, and highlights the need for more well-designed studies that look at the long-term effects of these changes in teaching practice.

Interventions

None of the interventions used in any of the studies were alike. Interventions included the use of a range of technologies, all used in different ways to enhance and expand the clinical experiences of healthcare students. In some cases the individual technologies were mentioned specifically, and these included VoIP, interactive whiteboards, course management systems, online lectures, video on CD, online MCQs and blogs. However, not all of the technological interventions were well described, with some studies leaving out essential details making it difficult to replicate these studies in other areas and domains. The face-to-face components of the blended approaches included lectures, small group discussion, completion of workbooks, practical sessions and game show formats for evaluation. These results showcase the range of environments and contexts in which blended learning was implemented and highlight the many different approaches that could be used. Even though there are many different approaches to implementing blended learning, it should be remembered that the primary emphasis is not on specific tools that should be used. Once the learning outcomes of the module have been selected, the tools should be chosen that best facilitate the achievement of those outcomes. Indeed, "...a mix of teaching and learning methods will always be the most efficient way to support student learning" (Laurillard, n.d.). Blended learning in clinical education may therefore be an appropriate method of using technology to implement custom interventions designed to

address specific gaps in students' repertoire of clinical competencies.

Clinical competencies

In all but one of the studies, results showed some measure of improvement in students' competencies, including reflective thinking skills (Cooner, 2010), clinical skills e.g. history taking, examination, reporting, documentation and patient management (Gordon et al., 2005; Lewing et al., 2009), self-efficacy (Sung, 2008) and clinical reasoning (Tan et al., 2010). In addition, two studies suggested that using a blended approach helped students to bridge the gap between theory and practice in clinical scenarios (Davies et al., 2005; Tan et al., 2010). There is thus evidence (if only on a small scale) to suggest that a blended approach to clinical education has some potential to address the highly contextual, complex needs that need to be fulfilled if healthcare graduates are to perform competently in clinical practice.



Ethical considerations

It is a concern that of the seven articles in this review, only two contained details of the ethical considerations undertaken by the researchers. With an increasing emphasis on the ethical treatment of human subjects in research (Medical Research Council, 2001), the lack of attention to reporting on this fundamental component of research seems to be problematic. It is recommended that authors engaged in student research ensure that they not only conform to ethical research protocols but that they include the details in their reporting.

f) Limitations

While every attempt was made to incorporate as much of the current evidence as was available, only a limited number of articles could be found for this review. However, owing to the rapidly developing field of technology and the emergence of blended learning as a versatile and flexible approach to teaching and learning, it is likely that publications already exist that would enhance or challenge the results of this review.

g) Conclusion

There is limited research available on the appropriate use of technology-enhanced learning environments as part of a blended approach to the clinical education of healthcare students. However, in the small number of studies that looked at the development of students' clinical competencies as a result of implementing a blended strategy, there was some evidence of improvement demonstrated. This did not always manifest in better grades but did address clinical competencies that were highlighted as being important for the development of practice knowledge, including improved reflective skills and clinical competencies, clinical reasoning and bridging of the gap between theory and practice. This limited pool of evidence therefore suggests that there may be practical benefits to further exploring the use of blended learning in clinical education among healthcare students. However, owing to the lack of depth in the literature, broad claims of improvement are difficult to make. The results of this review indicate that further research in this area is necessary before educators make assumptions about the long-term effects of blended learning in clinical education.



3.3. Conclusion

The systematic review presented in the previous section highlighted that there were few high-quality studies evaluating blended learning in clinical education at the outset of this project. However, the small number of studies that looked at the development of students' clinical skills did find some level of improvement. These were not always evident from an increase in grades but did go some way towards improving clinical competencies that have been identified as being important for the development of practice knowledge. These include improved reflective skills, clinical reasoning and bridging of the gap between theory and practice. This suggests that grades may not be the best way to determine the progression of physiotherapy students as they move towards capability.

One of the challenges I faced during the development of this systematic review was trying to develop a review protocol that took into account the role of social media in the serendipitous discovery of research. Here is an excerpt of a blog post I wrote while reflecting on this problem, highlighting what I was thinking at the time.⁸

Yesterday I was talking to my supervisor about how I'm having difficulty designing a protocol for my systematic review. The guidelines I'm looking at are very good for designing a structured process for searching through the literature, but they're not very good at helping me to define a search that includes social media.

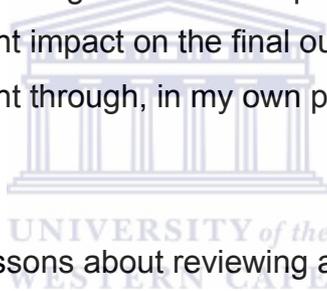
As if in response to that conversation, I had the following experience earlier today. I got an email from Twitter informing me that I had a new follower. I clicked the link and was taken to the profile of someone interested in similar things to me. I followed him, went through a few of his tweets and ended up following a few of his followers. One of those followers had tweeted about a page on danah boyd's site that was a collection of Research on Twitter and Microblogging. I found 18 useful papers on that page that I probably would never have found if I'd had to stick to a review protocol that was designed to search commonly recognised sources (e.g. PubMed, CINAHL, library

⁸ The full post is available at <http://www.mrowe.co.za/blog/2009/10/can-established-research-methodologies-cope-with-social-media/>

databases, etc). How can I define the process that I went through today in generic terms (because the same thing can happen when I'm going through news feeds, Delicious, Slideshare, etc.) when it's so serendipitous... . How about using Mendeley as an article database?

It seems that I can define my protocol loosely, which means that no-one else will be able to reproduce the study... . Or, I can define my protocol strictly and potentially miss a hundred important articles, which will make my review equally poor. Do we need to re-evaluate established research methodologies to take into account the disruptive nature of social media, or am I missing something?

This reflection demonstrates an aspect of engaging with the research process in a critical way, rather than simply following a series of steps. While the questions raised ultimately did not have a significant impact on the final outcome of the review, it is an example of the development I went through, in my own process of becoming a researcher.



I also learned several valuable lessons about reviewing articles during the process. The following blog post, written during the final phase of writing up the review, presents some of the lessons I learned.⁹

I just spent the last 3 days at a writing workshop in Hermanus, organised so that the PhD students in our department could spend some focused time working on our systematic reviews. I prepared the proposal in the days leading up to the workshop, and had the opportunity to refine it following a presentation to the group on the first day. Here are a few things that I learned during the process:

- The proposal, if well designed, is the blueprint for everything you do. If you take shortcuts with it, it will only take longer in the end
- Just because an author uses the same words you do, they may not be meant in the same context i.e. keywords alone are not good indicators of eligibility

⁹ The full post is available at <http://www.mrowe.co.za/blog/2010/06/systematic-review-workshop/>

- I usually take the conclusions of published papers at face value, but on critical review the conclusions are sometimes not based on the actual study results
- Critical appraisal tools really expose the weaknesses of published research (and all papers have weaknesses)
- The process takes longer than anticipated, and at some point you have to call off the search for eligible papers

I now have an article outline and am busy with the data extraction process. If I can keep to my timetable, I'll have a complete draft by the end of August.

Submission of a systematic review is one of my first objectives and will give me a baseline for how I will plan my own implementation of blended learning in clinical education.

The reflection above shows that conducting research is not simply a matter of following a plan to answer questions. The research process is one of personal and professional development, leading to a transformation of the researcher. Knowing how to conduct a systematic review is not the same as actually going through the process. This theme would emerge again later, when further study results suggested that students' learning would be improved when new theoretical concepts could be mapped to their own personal experiences.

This chapter aimed to assess the impact of blending learning on healthcare students' clinical competencies as part of clinical education. It answered the question: How can blended learning be used to develop healthcare students' clinical competencies as part of clinical education? The next chapter presents the results of a survey conducted in the physiotherapy department, that aimed to identify the challenges that might arise if the integration of technology into the undergraduate curriculum were to be attempted.

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4. Chapter Four: Using technology for learning

The world is changed

Galadriel, in Tolkien (1954)

4.1. Introduction

Chapter Three presented the results of a systematic review of the literature that aimed to determine if a blended approach to teaching and learning in clinical education could be used to develop clinical competencies in healthcare students. While few well-designed studies were identified within the review period, the findings suggest that blended learning has the potential to address some of the challenges in clinical education. These include the development of competencies that do not include knowledge and skills, like reflection, lifelong learning, clinical reasoning, and critical thinking, which are generally difficult for students to develop when didactic teaching methods are used.

It is important to note that those studies were conducted in developed countries with good technical infrastructure, that blended learning is highly context-dependent, and that interventions seem to have been designed to solve specific problems within certain contexts. This indicates that a blended learning module in South Africa should be designed with custom interventions to address specific gaps in a curriculum, and that are cognisant of the unique challenges faced in this department, in the South African context. However, the use of technology in higher education in South Africa is poorly researched, and there is limited evidence for this approach in the context clinical education.

In cases where research has been done, it suggests that South African university students struggle not only with physical access to computers and the internet, but with epistemological access too. Disciplines and academia in general rely on a language and culture that is hidden and inaccessible from the student, providing obstacles to their progress that lie beyond their ability to understand the work (Bozalek, Gararway & McKenna, 2012). South African students in higher education have also demonstrated that even when they do use technology as part of the teaching and learning practices, there is a tendency to focus on the discovery of information, rather than on enhancing

communication (Czerniewicz & Brown, 2005; Rowe & Struthers, 2009). This is a concern for anyone considering the use of technology in teaching and learning, since meaningful learning relies on dialogue and communication, which emerging online tools are well-placed to enhance.

If a blended learning module means that technology is integrated in order to add to and extend the possibilities for learning through different means of communication, then it follows that students must be able to use the technology for more than information discovery. With this in mind, the next section of Chapter Four presents the results of a survey that explored the online tools that a group of South African physiotherapy students were familiar with, and how they used those tools as part of their learning practices. The aim of this chapter was to determine physiotherapy students' experiences with, and attitudes towards the use of technology in their learning practices. It also answered the question: How do undergraduate physiotherapy students use online technology as part of their learning practices?

The next section of this chapter has been published as:

Rowe, M., Frantz, J., & Bozalek, V. (2012). Physiotherapy students' use of emerging online technology as part of their learning practices. *South African Journal of Physiotherapy*, 68(1), 29-34.¹⁰

M.R. was responsible for substantial contributions to the conception and design of the project, the acquisition of data, and analysis and interpretation of the results.

J.F. and V.B. contributed to analysis and interpretation of results.

M.R. was responsible for drafting the article from conception to the final, submitted version.

J.F. and V.B. were responsible for the final approval of the version to be published, and for critical reading of the paper.

¹⁰ Communication between the reviewers and researcher is included in Appendix V.



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4.2. Use of technology as part of learning practices: A case study

Abstract

The relevance of non-technical skills have long been acknowledged as important components of clinical learning, and there is evidence that integrating technology can facilitate their development by encouraging reflection, and by enhancing communication and reasoning. However, effectively integrating technology into learning practices must take the contextual needs of students into consideration. The aim of this study was to determine what online tools undergraduate physiotherapy students at one South African university are familiar with, and how they use them as part of their learning practices.

The case study was conducted in a university physiotherapy department in the Western Cape during 2010. A cross-sectional, descriptive design used a survey to obtain quantitative and qualitative data from participants, and a pilot study was conducted to test the reliability of the instrument. All ethical considerations were adhered to.

More than half of participants had access to the internet at home, and most of them belonged to a social network, although fewer than half used it for their studying. Few students reported using the internet for more than information retrieval but reported wanting to use it for enhanced communication with lecturers. Almost all respondents believed that lectures were a useful way to learn, and many added that integrating online learning activities with lectures could have value.

Integrating technology into healthcare education has the potential to develop non-technical skills that are relevant for clinical practice. However, this group of students currently lack the experience and insight to use technology effectively as part of their learning practices. Educators must take cognisance of the educational and contextual needs of students if they wish to integrate technology into clinical teaching.

Keywords: physiotherapy students, healthcare education, technology enabled learning, social networks

a) Background

While the physiotherapy profession continues to emphasise evidence-based practice, it is vital that we not lose focus on the non-technical skills that are required for effective clinical practice. The importance of reflection and other generic skills in the development of practice knowledge in health professionals is well documented (Higgs et al., 2004). These non-technical skills include, among others, reflective thinking, interpersonal skills, critical evaluation of practice, accountability, clinical reasoning, bridging theory and practice, and articulating rationales for treatment (Higgs et al., 1991). The use of reflection to promote clinical reasoning has shown that when educators use their expertise to focus, guide and direct students in clinical practice, learning outcomes are positively affected (Murphy, 2004). Productive learning activities that have been shown to be effective in healthcare education include individual contact, discussion and feedback (Ernstzen & Bitzer, 2009; Windish et al., 2005). In addition, the integration of critical cross-field outcomes into all South African curricula has highlighted the importance of generic graduate attributes. These include the ability to access and critically evaluate information, and to work effectively with others (South African Qualifications Authority, 2011). It is therefore evident that non-technical skills have an important role to play in the development of competent healthcare professionals.

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However, the majority of educators within medical education still make use of teaching activities that "...knowingly fail to change...behavior" (Cohen, 2004, p. 2). In addition, many medical teachers have little formal qualification in teaching and therefore teach as they were taught (Hurst, 2004). If clinical teaching is to make an impact on improving patient care, there is a need to incorporate more interactive approaches to teaching and learning activities (Graffam, 2007). There is evidence that the use of technology can facilitate an active approach to teaching and learning in healthcare education, which can improve professional education and student support, mainly through better communication and increased access to information (Rowe & Struthers, 2009). In addition, the use of online collaborative environments like blogs¹¹ and wikis¹² have the potential to encourage

¹¹ A blog is a personal webpage that allows users to post entries in reverse chronological order and moves older entries into an archive, much like a journal (Quiggin, 2006).

¹² Wikis are websites that are able to be edited by anyone. Users can create, edit and delete pages and content using a simple text-editing interface (Duffy & Bruns, 2006).

reflection and clinical reasoning in professional practice among undergraduate physiotherapy students (Boulos et al., 2006; Hartshorne & Ajjan, 2009; Ladyshevsky & Gardner, 2008; Mori et al., 2008). Blending technology into healthcare education has also been shown to help develop interprofessional team process skills, team dynamics, decision-making and conflict resolution skills (Carbonaro et al., 2008). Finally, there is evidence that students who displayed deep learning traits when using technology-enhanced learning (TEL) have also been shown to perform better in assessments of their clinical skills (Gormley et al., 2009). This may be because blending technology and face-to-face engagement has been shown to help bridge the gap between theory and its application in practice (Davies et al., 2005).

There is therefore increasing evidence that the integration of online technologies into healthcare education can be effective in facilitating learning environments that encourage the development of non-technical skills such as collaboration, reflection and knowledge sharing. However, there are many challenges involved in the process of integrating technology into teaching and learning, including the fact that educators must model the behaviour they expect from students (Gray & Tobin, 2010). The effectiveness of using Information and Communication Technology (ICTs) in teaching and learning lies not in its presence in the curriculum but rather in how it is deployed in order to mediate the learning process (Postholm, 2007). In addition, many South African students use ICTs merely for content acquisition and simple research, rather than taking advantage of the many possibilities for enhanced communication (Czerniewicz & Brown, 2005; Rowe & Struthers, 2009). Even though there have been many attempts to make use of collaborative online tools to facilitate health professional education, these have often been unsuccessful. This has been largely because the contextual working and learning needs of students were not taken into consideration during implementation, and support was not provided (Sandars et al, 2007). Finally, South African students from lower socio-economic groups have more difficulty getting online when they are not on campus, placing them at a greater disadvantage than they already experience (Czerniewicz, et al, 2009). These are important considerations to be aware of, especially in light of the fact that the university in which this study was conducted places considerable value on the integration of technology into teaching practice (University of the Western Cape, 2009). Therefore, integrating TEL practices into healthcare education will require a change in culture among clinical

educators, who will have to become familiar with online environments if they are to engage with their students in these spaces.

It seems clear that TEL strategies can be used to develop non-technical attributes that can play an important role in healthcare education. However, before healthcare programmes can integrate technology into the curriculum, it is important to understand if and how students already use technology as part of their studies. The aim of this case study was to determine what online tools this group of South African undergraduate physiotherapy students were familiar with, and whether they used those tools as part of their learning practices. The results of this study will be used to inform the development of innovative teaching strategies within this undergraduate physiotherapy programme.

b) Method

Research setting and sample

This case study was conducted as part of a larger research project within the physiotherapy department at the University of the Western Cape during 2010, among all undergraduate physiotherapy students (n=131).



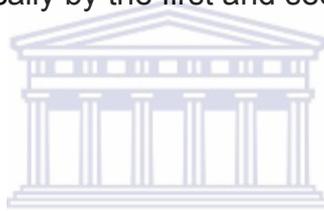
Study design

A cross-sectional, descriptive design was used to obtain both quantitative and qualitative data by means of a survey questionnaire with closed- and open-ended questions (see Appendix II). The questionnaire was developed using the study objectives and a review of relevant literature (Boynton & Greenhalgh, 2004; Hargittai, 2010). Closed-ended questions included Yes / No responses and a visual analogue and five point Likert scale. These were used to identify participants' learning preferences and their comfort when engaging in online activities. Open-ended questions were used to provide context and depth to the closed-ended responses. The questionnaire made use of five categories, including; Internet access, Use of online tools, Learning preferences, Attitudes towards teaching practices, and Demographic information. A pilot study was conducted with participants from the 2nd year class (n=30) in order to test the reliability of the instrument. A test-retest analysis with a one week gap between tests demonstrated that the instrument was reliable (Cronbach's alpha = 0.74). Student feedback and analysis of the results led to

improvement of the instrument by removing ambiguity and standardising terminology. Finally, consultation with two experienced researchers in the field of healthcare education was used to improve face and content validity.

Procedure

The survey was administered to all registered students in the remaining three undergraduate classes when they were on campus, taking into account the clinical rotations of the students. The 4th year students were surveyed during the second term, while the 1st and 3rd year surveys were completed in the third term. The researcher was present during the surveys in order to address any questions that might arise. Data were captured using double entry to ensure consistency and accuracy, and was analysed descriptively (Paulsen, Overgaard & Lauritsen, 2011). Responses to open-ended questions were analysed thematically by the first and second authors, until consensus was reached.



Ethical considerations

The project was approved by the University of the Western Cape's Ethics Committee (registration number: 09/8/16), and permission to conduct the survey was obtained from the Head of Department. Each questionnaire was accompanied by an information sheet explaining the background and reason for conducting the survey. Students gave written, informed consent following an opportunity to clarify the study details. Participation in the survey was voluntary and students were informed that they could withdraw at any time with no negative consequences. Anonymity of participants was insured by not gathering personally identifiable information and all data was kept confidential and secure.

c) Results

One hundred and thirty one questionnaires were distributed among all undergraduate students in the department. The sample included all students who completed and submitted the questionnaire (N=109), indicating a response rate of 83%.¹³ Seventy three percent (n=80) of the respondents were female. Response by year of study and gender can be seen in Table 4.1 below.

¹³ All percentages have been rounded to the nearest whole number.

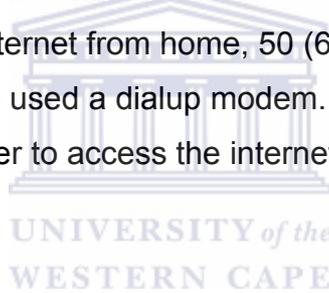
Table 4.1: Student responses by year of study (N = 109)

Year	No. of responses		Response by class
	Female	Male	
1	35 (32%)	14 (13%)	49 (45%)
2	Included in pilot study, excluded from main study		N/A
3	22 (20%)	6 (6%)	28 (26%)
4	23 (21%)	5 (5%)	28 (26%)

Note: 4 respondents did not record their gender

Access to computers and the internet

Eighty three students (76%) had internet access at home and the other respondents reported accessing the internet from internet cafés, friends' homes, family members' homes and parents' workplaces. All students had access to the internet on campus. Of the students who connected to the internet from home, 50 (60%) used broadband, 23 (28%) used a 3G modem, and 10 (12%) used a dialup modem. Seventy one (65%) students reported using a desktop computer to access the internet, 59 (54%) used a laptop, and 77 (71%) used phones.¹⁴



Use of collaborative online tools and services

Of the 89 respondents (82%) who reported using the internet during the learning process, 75 (84%) reported that they used it mainly to retrieve information. One hundred and one students (93%) reported belonging to a social network¹⁵, with 27 checking it hourly, and 59 checking it at least once a day. Fewer than half of the 101 students who reported belonging to a social network (49%) used it as part of their studying. The students who did use their social networks as part of their studies used it for either administrative tasks (e.g. confirming test dates), getting information (e.g. content for assignments), asking for help and to a limited extent, discussion. The following three quotes are used to give an example of the areas in which students used social networks:

¹⁴ Students were able to specify multiple devices for connecting to the internet

¹⁵ Students were not asked which network they used, although Facebook and MXit were identified most often in the open-ended responses

“To get information and connect with people that can help me if I don't know something”

“...inform or be informed of campus life e.g. Test content covered, dates and venues”

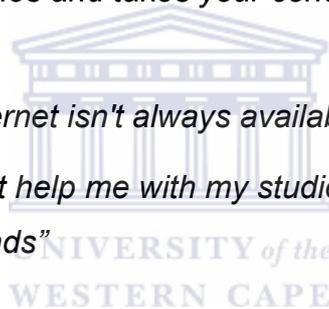
“Asking questions and sharing information”

Students who did not use social networks as part of their learning used reasoning that fell into four main categories: it was distracting, it was for socialising and not studying, difficulty with access and finally, that they didn't know how their social networks would be useful for studying. The following three quotes are used as examples:

“It interferes with your studies and takes your concentration and focus off work”

“...I study at home and internet isn't always available”

“The social network cannot help me with my studies its only there to communicate with my friends”



The following table (Table 4.2) highlights online activities that students reported engaging in as part of their studies, as well as socially. The list was compiled following a review of the literature to determine common online activities.

Table 4.2: Participants' engagement in common online activities (N=109)

Online activity	n (%)
Watched a video	62 (57%)
Read something on Wikipedia	55 (50%)
Uploaded photos	47 (43%)
Uploaded a video	12 (11%)
Created a blog post	10 (9%)
Edited Wikipedia	6 (6%)

Table 4.2 (above) demonstrates that this group of students use the internet mainly to

consume content. However, almost half of them also create content by sharing photos with each other. There were no data on how often students engaged with each other around shared content.

Table 4.3: Participants' understanding of common online tools (N=109)

Online tool	Correct idea	Basic idea	No idea
	n (%)	n (%)	n (%)
Blog	25 (23%)	24 (22%)	60 (55%)
Podcast	8 (7%)	6 (6%)	95 (87%)
Wiki	1 (1%)	16 (15%)	92 (84%)

Table 4.3 (above) highlights the fact that more students had a good idea of what “blogging” means and is probably the result of a series of assignments that were run in the department during 2010, in which students participated in reflective blogging assignments within a social network. One participant suggested that wikis were sources of “unreliable information”, and another that they were “excellent resources”. Twelve participants (11%) understood that podcasts were somehow related to online audio or video files but were not clear on what the relationship was. Table 4.4 (below) presents that data on students' learning preferences.

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Table 4.4: Participants' personal learning preferences (N=109)

Learning preference	n (%)
Lectures	101 (93%)
Pictures and graphics	84 (77%)
Printed text	79 (72%)
Discussion with others	76 (70%)
Study groups	35 (32%)
Cramming	33 (30%)

Note: students were able to select multiple options

Table 4.4 (above) highlights that almost all respondents (n=101, 93%) reported that lectures are still a useful way to learn, although 67 of them (61%) added that integrating online learning activities with lectures could have value. One of the main areas in which they wanted to see further use of online tools was for additional means of communicating

with lecturers. Students requested greater use of email, cellphones, social networks and blogs.

d) Discussion

While the lack of access to computers and the internet among South African university students is a real problem (Czerniewicz & Brown, 2005), this particular group seemed to have relatively better access than most. More than 75% had access to the internet at home and made use of it via desktop and laptop computers, as well as cellphones. The high number of respondents (71%) who accessed the internet through their mobile devices was not surprising, considering that a previous study in the same department found that 84% of students were active on MXit, a mobile communication service (Rowe, 2009). However, even though most of the participants had internet access at home, many of them lacked experience in using ICTs. Their responses highlighted a poor understanding of several technologies commonly used to develop collaborative and reflective skills, namely wikis, blogs and podcasts (Boulos et al, 2006). The online activities that respondents were most familiar with included reading Wikipedia and watching videos. This would suggest that these participants used the internet mainly for consumption of content, rather than collaboration and discussion.



Even though more than 90% of participants belonged to a social network, fewer than half used them as part of their learning activities. Of the participants who did use their social networks as part of their studies, most used it for curriculum administrative tasks and for getting course-related information (e.g. sharing test dates). This is in keeping with the results of a national study in 2007, which found that South African physiotherapy students mainly used computers and the internet to gather information rather than to seek support through enhanced communication with peers and lecturers (Rowe & Struthers, 2009). If educators wish to make use of ICTs to develop non-technical skills like reflection and reasoning, they will have to encourage activities that incorporate discussion, collaborative work and reflective engagement.

Students in this study expressed a preference for learning activities that make use of graphical and textual representations of information, as well as formats that involve

discussion. The use of ICTs can have a significant impact on learners who express a preference for visual engagement as part of their learning. The ability to embed multimedia within collaborative online spaces means that students can not only share information in the form of images and video, but can also create asynchronous conversations and discussion around it. However, even though these students reported preferences for visual and collaborative learning strategies, they didn't seem to realise that social networks could facilitate these aspects of their learning practice. Instead, they used the internet and their social networks to gather and share administrative information and to consume content.

While most of these participants valued lectures as useful ways of learning they also wanted to add online learning activities and additional channels of communication to the curriculum, including greater use of cellphones. Together with the fact that 71% of respondents reported using their mobile devices to access the internet, this would seem to indicate that this group of students are prepared for synchronous learning when off campus. This is a positive result, especially in light of the fact that other students have also reported valuing communication as an important component of learning in clinical contexts (Ernstzen & Bitzer, 2009). One concern in terms of students' learning preferences is that more than a third of this cohort reported that "cramming" was an appropriate learning strategy. In fact, students' memorising of content is actually an indicator of poor assessment practices from lecturers, as students are not required to develop higher order thinking skills in order to pass (Brown et al, 1997). In contrast, ICTs have been shown to encourage the development of collaborative, reflective and reasoning skills that may help students move away from memorising content. If assessment does indeed drive learning then educators must ensure that their use of ICTs fosters the development of the non-technical skills that are relevant for clinical practice, rather than merely challenging students to find content.

e) Conclusion, limitations and recommendations

The fact that 73% of participants in this case study were female indicates that there might be gender bias present in the results. In addition, almost half of the participants were in their first year of study, suggesting that they may not yet have developed the necessary skills to make use of more sophisticated learning strategies. The survey may also have yielded more interesting data if there had been more open-ended questions. The results of

this study would seem to indicate that even though the majority of these physiotherapy students have access to the internet, many lack the deeper understanding of ICTs that would allow them to make effective use of it as part of their studies. Integrating technology into teaching and learning practice has the potential to help develop the non-technical skills that are so important in clinical practice. However, this particular group of students currently lack the experience and insight to make effective use of online technologies as part of their clinical learning experiences. In addition, educators wishing to make use of technology as part of their teaching practices, must take care to implement it in ways that take cognisance of the educational and contextual needs of the learners.



4.3. Conclusion

Chapter Four highlighted some of the challenges around integrating technology into a teaching programme from the perspective of the students within this physiotherapy department. The major finding was that students used online technology for gathering and consuming information, but not for discussion, interaction, collaboration or to stimulate reflection. This confirmed what other studies have found in the past, and seems to be the main way in which South African higher education students use computers and the internet (Czerniewicz & Brown, 2005). Since the primary use of technology in mediating teaching and learning is as a means of enhancing communication (Anderson, 2011), this group of students seemed unprepared to use it as part of their teaching and learning practices. If we are to use social constructivism as a theory of learning to inform technology-integrated teaching with the aim of enhancing communication, we must help students develop the knowledge and skills necessary to make effective use of these tools.

There was a clear disconnect between having a social presence online and the opportunities for using social networks in learning. While their physical access to computers and the internet was not as problematic as expected, their epistemological access was limited, with few students having a good understanding of how to use online technology for learning. In terms of using technology to fundamentally change how they learn, they would require significant support and input in order to change the culture and mindset around their understanding of teaching and learning. Failure to provide technical, structural, social and cultural support could lead to student non-use of technology, which could potentially constrain their learning if the technology is deeply embedded in the programme (Orton-Johnson, 2009).

This study also confirmed that this group of students did not possess the characteristics of those in the “net generation”, highlighting the disconnect between a belief that younger students are intimately familiar with digital technology, and the reality of students' actual use. Educators need to be aware that assumptions made regarding students' technological ability could have negative consequences for teaching and learning practices. When technology is used, teachers must ensure that students are not only familiar with the technical aspects of using the tools (i.e. *how* to use the technology) but

also the pedagogical aspects (i.e. *why* the technology is being used).

This chapter marks the end of the first phase of the design research process. At this stage of the project, there is a description of the problem in the context of higher education in general, and physiotherapy education in particular. Several reviews of the literature have identified some of the ways in which others have sought to address similar problems in clinical education. Some of the relevant stakeholders have provided input into developing this understanding of the problem, which will serve as a baseline for the development of an intervention that aims to develop capability in physiotherapy students. The next chapter describes the beginning of the second phase of the design research process, which involves further research into the development of a blended intervention.



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5. Chapter Five: Identifying relevant theoretical frameworks

Humans may crave absolute certainty; they may aspire to it; they may pretend...to have attained it. But the history of science - by far the most successful claim to knowledge accessible to humans - teaches that the most we can hope for is successive improvement in our understanding

Carl Sagan (1995, p. 28)

5.1. Introduction

Chapter Five marks the beginning of the second phase of the design research process, which explores the development of solutions that are informed by existing design principles and technological innovations. By the end of this phase (Chapter Eight), an initial set of draft design principles will be presented as a result of the studies conducted in Chapters Five to Eight. There are three key aspects of this phase.

1. Draft design principles from the literature. This aspect of the research process is addressed in this chapter, using a narrative review of the literature that describes a range of theoretical frameworks that are appropriate for studies looking at educational technology. This review serves to explicitly review theories of learning and teaching that could help to develop a better understanding of the conceptual frameworks that may have relevance to this project. By using this review to develop the first set of draft design principles, it is clear that the final study output will have been based, from the outset, on a firm theoretical foundation.

2. Consider how best to operationalise the intervention in an e-learning environment, using appropriate technologies. This aspect of the project is explored in Chapters Six to Eight, using two pilot studies that aimed to identify the advantages and disadvantages of two blended approaches to developing certain aspects of capability, as well as a Delphi study that used input from a range of experts to contribute ideas towards the design of the intervention.

3. *Design the learning environment.* This aspect of the second phase of the design research process is addressed in Chapter Nine, which describes how the module was designed and implemented during the first semester of 2012.

The next section of this chapter aims to explore theories of learning and “technology-aware” teaching frameworks that could be used to inform the development of a blended approach to clinical education. It also answers the question: What technology-aware models of teaching are derived from learning theories that could be used to inform the design of a blended learning module?

The next section of this chapter has been submitted to *Teaching and Learning in Medicine* as:

Rowe, M., Bozalek, V., & Frantz, J. (2012). A theoretical approach to technology-mediated teaching and learning in medical education.

M.R. was responsible for substantial contributions to the conception and design of the project, the acquisition of data, and analysis and interpretation of the results.

V.B. and J.F. contributed to analysis and interpretation of results.

M.R. was responsible for drafting the article from conception to the final, submitted version.

V.B. and J.F. were responsible for the final approval of the version to be published, and for critical reading of the paper.

5.2. A theoretical approach to technology-mediated teaching and learning

Abstract

Background: Medical education is in need of reform, partly as a result of approaches to education that privilege the individual over the group. Medical educators should look to socio-cultural theoretical frameworks that recognise the collaborative nature of learning. In addition, the use of technology may have a role in this reform, but there is little evidence that it in itself will transform medical education. Rather, instructional design that integrates technology should be informed by social theories of learning.

Findings: This paper explores three “technology-aware” teaching frameworks that acknowledge the social and cultural influences on student learning in the clinical context. These include the Conversational Framework, the Community of Inquiry and Authentic Learning. The combination of learning theory, teaching frameworks and emerging online technologies provide a space in which medical educators can create cognitively authentic learning experiences for medical students.

Conclusion: By exploring teaching frameworks that explicitly acknowledge learning theory and its relationship to technology-mediated learning, educators can gain valuable insights into changing teaching practices. By integrating socio-cultural perspectives and the affordances of technology in instructional design, we can develop relevant curricula that better prepare students for the dynamic context of clinical practice.

Keywords: authentic learning, community of inquiry, conversational framework, learning theory, medical education, technology

a) Medical education reform

In 1910 Flexner published a report that led to an overhaul of the American medical education system and introduced a scientific approach to the curriculum, the impact of which is still evident today (Flexner, 1910; Frenk et al., 2010). Now, 102 years later, the medical education community is again faced with calls for sweeping reform to a system that is “inadequate to meet the needs of medicine” (Cooke et al., 2006). Professional curricula are fragmented, outdated and static, resulting in the graduation of medical professionals who are ill-equipped to meet the challenges of complex global health systems (Frenk et al., 2010). It is clear that, while the science of practising medicine has changed significantly in the past few decades, the teaching of medicine has not changed much at all (Graffam, 2007). One of the reasons for this lack of curriculum development may be that medical education is built on a narrow foundation of educational theory that is insufficient to address the full range of learning in the dynamic and complex clinical environments (Bleakley, 2010). Medical educators tend to use theoretical frameworks that ignore the socio-cultural context of learning and instead focus on the isolated individual (Bleakley, 2006). This may stem from the medical community's traditional positioning of the “heroic” individual above the collaborative team. This privileging of the individual is expressed in the learning theories that inform much of medical education research, including personal reflection, experiential learning and adult learning theory, all of which isolate the learner from the activity, the context and their peers (Bleakley, 2010).

While no single learning theory can encompass the full range of medical practice, there is some evidence that socio-cultural perspectives may better inform the teaching and learning activities necessary for clinical practice (Bleakley, 2010). In the increasingly connected clinical contexts where medical students must interact with a diverse range of healthcare professionals as part of interdisciplinary teams (Frenk et al., 2010), we should base teaching practices on theories of learning that are cognisant of the collaborative nature of learning. These teaching approaches should position the medical student as one participant in a learning community with shared objectives, rather than an isolated individual in competition with others.

Frenk et al. (2010) have proposed a series of teaching and institutional reforms that aim to better prepare medical graduates for the healthcare systems in which they are called to

serve. One of these reforms calls for the creative use of Information Technology (IT) to develop “collaborative connectivity, and management of the increase in knowledge” in order to facilitate transformative learning that moves beyond content transmission (Frenk et al., 2010). While there seems, at first glance, to be a wealth of research into the use of technology-mediated teaching and learning activities in medical education, closer examination reveals that much of this research is practice-based and descriptive in nature. There is little evidence that medical educators have used socio-cultural theoretical models to inform technology-mediated teaching, with some authors asserting that the pedagogical evidence base for the use of technology in medical and health education is poor (Boulos, Maramba & Wheeler, 2006).

In order for innovative, technology-mediated teaching to evolve, medical educators should inform teaching practices with theories that are fit for the purpose of mediating learning, thereby developing its theoretical underpinnings to provide a common philosophy for further discussion (Mehlenbacher, 2010). The aim of this paper is to explore social learning theories that consider the role of technology, and which may be useful to inform the design of medical curricula in order to better prepare clinicians for the next century of healthcare.

b) Social theories of learning

Social theories of learning arose in the former Soviet Union through the work of Vygotsky, who emphasised the role of interaction in a social and cultural context as part of the learning process. Vygotsky identified language and symbolic representation (e.g. diagrams and images) as the means by which ideas are shared and discussed in social interactions, making conversation and dialogue central aspects of learning (Vygotsky, 1978). His ideas led to the development of social constructivism, which suggests that knowledge is collaboratively constructed when learners actively engage with multiple viewpoints through sustained dialogue, in a mediated process (Anderson, 2010; Lave & Wenger, 1991). From this perspective, knowledge is distributed across a community, rather than residing “in” a person (Bleakley, 2006), and learning is mediated through social and cultural means which can include more knowledgeable peers, language, symbols and technology. This can be seen in the clinical context in the distributed memories and culture of clinical teams, in which anecdotes are used to articulate and negotiate the common knowledge of the group. These stories can be shared in conversations, or via email and social networks, and can constitute a distributed digital record of, among other things, the idiosyncrasies of clinical

staff, ward social norms and even clinical practice (Bleakley, 2010).

Constructivist approaches to learning suggest that it is an active process of constructing, rather than acquiring knowledge, and that teaching is a process of supporting this construction, rather than the transmission of knowledge (Laurillard, 2002). One of the most important concepts to arise from Vygotsky's work is the Zone of Proximal Development (ZPD), the space between what a learner can do independently and what they are potentially able to do under the guided assistance of a More Knowledgeable Other. This notion of the ZPD is the underlying concept behind scaffolding, where learning is facilitated when the teacher (or student peer) provides guidance that helps the novice make a conceptual leap to a higher cognitive level than they would be capable of independently (Vygotsky, 1978). Scaffolding in the clinical context is evident during ward rounds, when a senior clinician uses guiding questions to provide insight to student doctors, helping them to make conceptual leaps to higher levels of understanding.

Social constructivism has informed the development of other theories that take emerging online technologies into consideration. One of these is connectivism, a “learning theory for the digital age” (Siemens, 2004), which has proven to be a useful lens through which learning and knowledge are viewed as being distributed across networks, people and devices (Bell, 2011). Connectivism suggests that learning is a process of connecting people, groups, and communities, that it may reside in non-human appliances (technology), and that these connections are needed to facilitate continued learning (Siemens, 2004). Influenced by social constructivism, network theory and chaos theory (Couros, 2010), connectivism suggests that learning environments are created and used by individuals as they access information, process, filter, recommend, and apply that information with the aid of machines, peers, and experts in their learning networks (Laurillard, 2002). Connectivism would therefore seem to fit comfortably alongside the proposal that IT be used in medical education to develop “the competencies to access, discriminate, analyse, and use knowledge” (Frenk et al., 2010).

In addition, connectivism stresses that learning facts and concepts is less important than learning “how to create paths to knowledge when it is needed” (Anderson, 2010, p. 34), and is fundamentally driven by a belief that technology reshapes the way that we create,

store and distribute knowledge (Couros, 2010). In connectivism, the teacher is seen as a curator and wayfinder, modelling both a physical and cognitive process for the learner, similar to the master / apprentice relationship. This perspective may assist in developing clinical teaching practices that acknowledge the cognitive apprenticeship necessary for medical students to learn how to think and recount the job (Bleakley, 2010).

Medical education has traditionally identified knowledge as a form of private capital that is isolated within the individual. This may have been true when information was scarce, and expertise was determined by how much access you had to it. However, expertise is no longer determined by access to information, but rather in how it is aggregated, filtered and linked across seemingly unrelated areas (Fraser & Greenhalgh, 2001). This requires a socio-cultural approach to knowledge in which it is a shared property, distributed between group members and artefacts. Consider a medical team in which “common knowledge” is a dynamic renegotiation of the facts of a case, residing simultaneously in the patient's medical folder, in the remembered conversations of group members, and distributed digitally in mobile devices and networked servers. The boundaries of “where” knowledge exists are becoming increasingly blurred. In this context, remembering is a “jointly realised activity” and cognition is distributed, rather than existing within an individual (Bleakley, 2010). Modern approaches to medical education should acknowledge that learning is social and that knowledge and cognition can be distributed among people and objects, over digital networks.

If learning theories such as social constructivism and connectivism have the potential to change how medical educators view the learning process, then it is prudent to explore how those theories of learning could be operationalised. If the aim of teaching is to make learning possible (Ramsden, 2003), we also need frameworks for teaching. When teaching is based on models derived from validated theory, we can say with more confidence that our practices facilitate meaningful learning.

c) Frameworks for technology-mediated teaching

One of the most powerful affordances¹⁶ of the Internet is that it provides the capacity for enhanced forms of communication in that it can be synchronous or asynchronous,

¹⁶ “The term affordance refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used” (Norman, 1988).

embedded with rich media, and stored, indexed, tagged, harvested, searched and sorted. It can be used for one-to-one, one-to-many, and many-to-many modes of communication, with little cost differentiation between them (Anderson, 2010). Emerging technology can be used to create new and different forms of communication and interaction, that create a sense of “transactional nearness” that stimulate meaningful learning activities (Kop, 2010). Online communication therefore seems to align well with Vygotsky's centrality of language and dialogue in the learning process. It therefore seems plausible that social and networked theories of learning (i.e. connectivism) may facilitate the development of meaningful learning experiences through the intentional use of enhanced communication provided by the Internet.

The conversational framework: dialogue in clinical learning

One of the more direct implications of social constructivism and the ZPD is that the knowledge that students bring with them influences how they integrate new knowledge (Laurillard, 2002). This is especially important for the medical teacher, who must identify what the student already knows in order to mediate the learning process. This requires not only an environment that facilitates the students' learning about the world, but also their learning about the description of the world. In other words, the way the world *is* may differ from the way it is *described*, and misconceptions in learning arise when this difference exists. It is therefore essential that the medical teacher is aware of these misconceptions by having the student articulate their description of the world, which can then be compared to the teacher's description of the world.¹⁷ In order to facilitate learning, the teacher must then help the student correct their misconceptions, which will automatically correct any faulty actions based on those misconceptions (Laurillard, 2002). In the clinical context, it is not enough to know that a student has performed a procedure incorrectly. We must also identify the underlying misconception that informed the incorrect action.

In Laurillard's conception of teaching and learning, interactive and iterative dialogue is the way in which teacher and learners' conceptions of the world are revealed, which provides the framework for continuing dialogue that is the necessary stimulus for learning. For Laurillard, teaching is essentially an activity that tries to help students change the way that they see the world, by interpreting it through the insight of others who have more

¹⁷ Note that there is no assumption that either of these descriptions maps directly on to how the world actually is.

experience of it. A ward round or case presentation among colleagues can be seen as a physical manifestation of the conversational framework. It is the frequently renegotiated understanding, through discussion, of a particular clinical context, using changing variables and probing questions to identify patterns and insights into patient outcomes.

If interactive dialogue between teacher and student facilitates meaningful learning, then the integration of technology into teaching practices may have value. When combined with the fact that the Internet provides powerful forms of enhanced communication, we see that it may be used to provide the intrinsic, adaptive and personalised communication that is necessary for learning to be meaningful (Anderson, 2010). However, even when technology-mediated instruction is informed by appropriate theoretical constructs, there is still a tendency to focus on the technology, rather than on what the technology affords us.

The Community of Inquiry: presence in online learning

One way to make the affordances of technology explicit, is to structure the teaching and learning activity on a framework that describes the different roles of participants. The Community of Inquiry (CoI) proposes that the effectiveness of online learning communities is dependent on the dynamic interaction between social, cognitive and teaching presence in the online space (Garrison, Anderson & Archer, 2000). It is therefore a useful framework for medical educators who are considering a teaching intervention that makes use of online technology, for example blogs or a social network, to enhance communication with students. In the absence of physical interaction, learners and teachers must recreate the normal processes that occur in a collaborative learning context via the dynamic interplay between these concepts of presence (Shea & Bidjerano, 2009a).

Social presence requires a trusted setting, in which participants develop interpersonal relationships by projecting their personality into the online space. It encourages the use of humour and emotional expression to support interpersonal relationships and the development of group cohesion. Learners (and teachers) can create a sense of social presence by communicating in ways that are perceived to be "warm", by participating regularly, responding quickly, and using synchronous communication to create a sense of "being there" (Kear, 2010). Cognitive presence in online learning spaces is the ability to construct meaning through sustained communication, which uses a triggering event to

present a problem, provides space to explore the problem, encourages the integration of variables to construct meaning, and finally presents a specific solution (Garrison & Anderson, 2003). Cognitive presence is essential for critical thinking, especially when facilitators model critical discourse and constructive critique (Fabro & Garrison, 1998). Teaching presence involves directing social and cognitive processes in order to develop personally meaningful and educationally worthwhile outcomes. It therefore has a regulatory and mediating role, including designing and structuring of the learning experience, facilitating discourse by maintaining interest, motivation and engagement, and directing instruction (Anderson, Rourke, Garrison & Archer, 2001).

Social, cognitive and teaching presence all interact with, and are dependent on, each other. In addition, comfort in online discussion is a significant factor in students' perceptions of cognitive presence, so in order to develop higher order critical thinking, students need to be comfortable with participating in the online discussion (Shea & Bidjerano, 2008; Shea & Bidjerano, 2009b). The Col framework is therefore dependent on the capacity for enhanced forms of communication provided by emerging online technologies. However, the use of an instructional framework to guide the process of technology-mediated learning is not enough to ensure that students integrate new knowledge into their world view. The design of the activity is an essential component that is often overlooked.

Authentic learning activities: thinking in a real world context

Authentic learning is an approach to instructional design that positions the task as the focus for authentic activity. It is grounded in the idea that meaningful learning occurs when it takes place in the social and physical context in which it is to be used (Seely Brown, Collins & Duguid, 1989). In this model, “authentic” does not mean “real” in the sense of the task being constructed in the real world, only that it is realistic and that it enables students to think and apply knowledge as they would in a real world context (Herrington, Reeves & Oliver, 2007).

Authentic learning in online spaces requires the willing suspension of disbelief in cases where initial reluctance to engage may result from a lack of realism in contexts that are not perfect simulations of the real world. When students do choose to go along with the

interpretation of the world that has been created then it is only internal inconsistency that causes dissonance. Using the example of case-based learning, common in medical education, the cognitive authenticity of the case is essential for learning to occur, and medical teachers must be aware of this when designing learning activities based on the real world. In learning spaces where the use of technology is often seen as a way of simplifying learning design, this approach demonstrates a model for designing environments of increased, rather than reduced, complexity (Herrington & Reeves, 2003; Herrington, Reeves & Oliver, 2010). This is clearly a more accurate reflection of learning in the clinical context, and may better prepare graduates to engage in these spaces as healthcare professionals.

d) Conclusion

This paper explored technology-mediated medical education from a socio-cultural perspective that encourages the social aspects of learning in clinical teams. We identified instructional frameworks that were based on those theories of learning, which could be used to guide teaching practices that can take place in both online and physical spaces. And finally, we discussed the development of cognitively authentic tasks that medical educators can use to create learning activities that more accurately reflect the dynamic and complex healthcare environments in which medical graduates are called to serve. If we are to take seriously the call for reform in medical education, rather than continuing to base teaching on models that emphasise the individual, we should view our teaching practice through the lens of socio-cultural learning theories that inform the design of authentic tasks, and which are cognisant of the affordances of technology. There is a wealth of social learning theories from the social science literature that are available to medical educators, which have the potential to inform the design of new curricula that are required to prepare students for the dynamic, complex context of clinical practice, especially if we want to begin integrating technology into teaching in a serious way.

5.3. Conclusion

Chapter Five presented three “technology-aware” models of teaching that are derived from learning theories incorporating the social, networked and distributed nature of learning that takes place in complex clinical environments. They all supported the idea that teaching is a process of facilitating the social construction of knowledge, rather than one in which knowledge is transferred from an expert to a novice. This is not to say that there is no expert or novice, only that the process by which learning occurs is not through transfer but guided instruction and discussion. Again, the notion of communication emerged as a central aspect of effective teaching and learning, particularly in the sense that it serves to expose misunderstanding and therefore provide the context for guidance towards deeper understanding.

It was noted that knowing facts was described as being less important than knowing how to think. In other words, teachers must help students create paths to knowledge when it is needed (Anderson, 2011), and to focus on helping students learn how to learn, a conception of teaching as a process that makes student learning possible (Ovens, Wells, Wallis & Hawkins, 2011; Ramsden, 2003). If learning is a social activity, and knowledge and cognition can be distributed among students and objects, over networks, then knowledge need not be thought of as a property of a person. Rather it can be a property of groups and objects, and that it can exist outside of the person, in online spaces. This perception of knowledge would fundamentally change approaches to learning environments, and create spaces for radical transformation. However, in order for these theories of learning to be used effectively in teaching, they must be operationalised through teaching frameworks, or ways of teaching that are framed around the learning theory.

One of the approaches explored was the conversational framework, which is premised on the idea that students and teachers must engage in structured dialogue in order to expose the ways of thinking of both parties. By committing to, and articulating the conceptual understanding behind their actions, students help teachers see their perspective, which allows the teacher to correct or reinforce the students' conception of the world. It emphasises the centrality of dialogue and feedback in the teaching and learning process,

and again reinforces the importance of communication and relationship between the teacher and learner.

Chapter Five concluded the first aspect of the second phase of the research process, and led to the development of a set of draft design principles. These design principles, informed by the literature review of relevant theoretical frameworks, are the foundations for learning designs that aim to develop capability in physiotherapy students, and are presented in Table 5.1 below. The column on the left identifies the design principle and the main studies that informed it, and the column on the right presents a rationale for including the principle in the context of learning.



Table 5.1: Initial set of draft guidelines for developing capability in physiotherapy students

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
<p>1. Encourage communication between people.</p> <p style="text-align: right;">Garrison, Anderson & Archer (2000) Vygotsky (1978)</p>	<p>Teaching is about creating spaces that support the social construction of personally meaningful knowledge, mediated through the use of language and symbols. Technology should be used to create new and powerful opportunities for enhanced communication.</p>
<p>2. Require the articulation of understanding.</p> <p style="text-align: right;">Herrington et al. (2010) Laurillard (2002) Vygotsky (1978)</p>	<p>By articulating their understanding of the world, students are taking their abstract thoughts and ideas, and giving them form and structure. By articulating what they already know, their understanding can be challenged or reinforced by others. This enables the teacher to either correct a misconception, or build on the correct understanding. This forms the basis for being challenged, and for defending challenges. By creating a representation of their thinking in the real world / articulating their thinking, this thinking can be challenged or reinforced.</p>
<p>3. Embrace complexity as an integral component of clinical learning.</p> <p style="text-align: right;">Bleakley (2010) Fraser (2001) Herrington et al. (2010)</p>	<p>We should aim to develop learning environments that are more complex, as this more closely resembles clinical practice than simplified versions of reality. As students encounter increasingly complex learning tasks, they must adapt to the evolving situation, taking into account new variables.</p>

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
<p>4. Are flexible enough to accommodate changing student needs, yet structured enough to provide guidance.</p> <p style="text-align: right;">Bleakley (2006) Fraser (2001)</p>	<p>As the learning tasks become more complex, the possibilities for moving in new directions increase. The learning environment must be capable of accommodating students' changing learning needs. The development of capability requires an environment that, while structured, is not prescriptive.</p>
<p>5. Aim to mediate learning relationships through interaction between people, content and objects.</p> <p style="text-align: right;">Bleakley (2010) Garrison, Anderson & Archer (2000) Herrington (2006) Laurillard (2002) Siemens (2004)</p>	<p>We should recognise that technology can fundamentally change the nature of teaching and learning practices, by taking into consideration the fact that knowledge does not have to reside <i>within</i> a person, but that it can exist in the spaces between people, objects or digital networks.</p> <p>By interacting with peers, staff members or clinicians, students are being introduced to the ways of thinking and being in the profession. The lecturer is a model for social, cognitive and teaching processes, demonstrating ways of thinking and <i>being</i> to students. But, these are also opportunities to develop trusting relationships, without which, meaningful learning is difficult.</p>
<p>6. Include opportunities for managing knowledge and information.</p> <p style="text-align: right;">Frenk et al. (2010) Siemens (2004)</p>	<p>Clinicians cannot plan for all possible outcomes that emerge from complex situations, so they must be prepared to adapt and change direction when necessary. However, they may not know everything they need to in order to adapt. When it is necessary to adapt, they need create their own “paths to knowledge” when it is needed, in order to adapt to dynamic and complex clinical situations. Learning environments should enable students to access, filter, process, evaluate, recommend, synthesise and share information, in a learning network.</p>

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
7. Are immersive, leading students to think as they would in the clinical context. <div style="text-align: right;">Herrington (2006)</div>	Meaningful learning must take place in the social and physical context in which it is to be used. Both online and classroom learning environments must create a sense of “cognitive realism” in that they must encourage students to think as they would in the real world of clinical practice.
8. Include tasks that are iterative or cyclical. <div style="text-align: right;">Laurillard (2002) Vygotsky (1978)</div>	Tasks should be designed so that students have opportunities to build on what they already know. Successive iterations of the task, or new tasks, should be scaffolded so that prior knowledge is explicitly required to proceed.

Table 5.1 (above) presents the initial set of draft principles that clinical educators should be aware of if they are interested in developing capability among students. Even at this early stage, it is evident that certain high-level concepts are beginning to emerge, including communication (or, interaction), articulation, complexity, relationships, flexibility and immersion. These principles are re-presented at the end of Chapter Six, taking into account lessons learned during that process.

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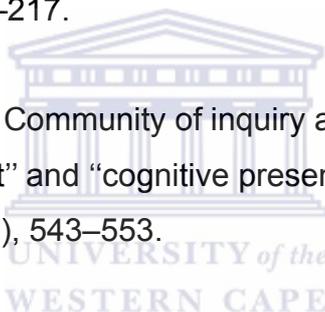
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6. Chapter Six: Wikis and small group learning

Before you become too entranced with gorgeous gadgets and mesmerizing video displays, let me remind you that information is not knowledge, knowledge is not wisdom, and wisdom is not foresight. Each grows out of the other, and we need them all.

Arthur C. Clarke (n.d.)

6.1. Introduction

The results presented in Chapter Four clearly demonstrated that assumptions could not be made about the abilities of this group of students to use online technologies as an integral part of learning practices. I needed to explore how to balance the online and classroom contexts, taking into account the complexities of how students work and learn, in order to better support them during any kind of curriculum reform (Orton-Johnson, 2009). In addition, findings from Chapter Five showed that there were a range of appropriate learning theories available, which could be used to guide the development and implementation of the module. However, I needed to learn more about teaching with technology on a practical level in this particular department before making any large scale changes. With this in mind, I conducted two pilot studies that integrated the lessons learned during the process, with the intention of further refining the principles that would guide the implementation of the blended learning module.

It is apparent from the evidence presented thus far, that sharing knowledge with others can help to expose (mis)understanding, and allow for the correction of inaccurate assumptions and conceptual relationships (Laurillard, 2002; Vygotsky, 1978). In addition, it is also clear that collaborative work in small groups can lead to the development of skills and attributes that have significant benefits for healthcare practitioners. A quick review of the literature led to the following list of benefits that can arise through small group learning (Crosby, 1997; Dent & Harden, 2005; Entwistle, Thompson & Tait, 1992; Kitchen, 2012; Walton, 1997).

Table 6.1: Benefits of small group learning

Benefit	Description
Promotes 'deep' learning	Encourages deep learning and higher order cognitive activities, such as analysis, evaluation and synthesis. Engage by being active participants in the learning process, as opposed to passively "absorbing" information.
Develops critical thinking skills	Allows students to develop critical thinking by exploring issues together and testing hypotheses that are difficult to do well in a lecture. This practice develops problem-solving skills.
Promotes discussion and communication skills	Environment is conducive to discussion. Students do not feel exposed or hidden, but are comfortable. Each student is encouraged to actively participate.
Active and adult learning	Help identify what a student does not understand, and discussion aids understanding by activating previously acquired knowledge. Students are encouraged to reflect on their experiences and develop self-regulatory skills.
Self motivation	Encourages involvement in the learning process, increasing motivation and learning. By taking responsibility for their learning they become self-motivated rather than being motivated by external factors e.g. the lecturer (<i>teacher-centred approaches usually do not facilitate self-directed learning</i>).
Develops transferable skills	Helps develop skills necessary for clinical practice, e.g. leadership, teamwork, organisation, prioritisation, providing support and encouragement for colleagues, problem solving and time management.
Application and development of ideas	Yields opportunities to apply ideas and consider potential outcomes. Making connections during group discussion enhances student understanding.
Tutor as a role model	A logical and systematic tutor approach demonstrating 'transferable' skills motivates student learning and development.
Recognises prior learning	Students are encouraged to <i>surface</i> their own prior knowledge, including their own perceptions (and misconceptions) of material previously covered
Social aspects of learning	Participation and social aspects of small group learning means that learning is more enjoyable than

	solitary approaches.
Encourages alternative viewpoints	Encourages an awareness of different perspectives on various topics and can therefore help develop an attitude of tolerance.

In addition to the academic benefits of having students work in small groups, the University of the Western Cape is also currently in the process of integrating graduate attributes into the curriculum. As was noted in Chapter One, graduate attributes are those characteristics of new graduates that go beyond the profession-specific knowledge and skills. The UWC Charter of Graduate Attributes (2009) includes the following descriptors:

- **Lifelong learning and critical attitude towards knowledge:** UWC graduates should be able to demonstrate a scholarly attitude to knowledge and understanding within the context of a rapidly changing environment. They should have the ability to actively engage in the generation of innovative and relevant knowledge and understanding through inquiry, critique and synthesis. They should be able to apply their knowledge to solve diverse problems and communicate their knowledge confidently and effectively.
- **Autonomous and collaborative:** UWC graduates will be able to work independently and in collaboration with others, in a way that is informed by openness, curiosity and a desire to meet new challenges.
- **Interpersonal flexibility and confidence to engage across difference:** UWC graduates should be able to interact with people from a variety of backgrounds and have the emotional insight and imagination to understand the viewpoints of others. They should be able to work in a productive team, to lead where necessary and to contribute their skills as required to solving complex problems.
- **Skilled Communicators:** UWC graduates should recognise and value communication as a tool for negotiating and creating new understanding, interacting with diverse others, and furthering their own learning. They should use effective communication as a tool to engage with new forms of complexity in social and

working life.

If educators are to create learning tasks that aim to develop the kinds of attributes described above, it is clear that they cannot have students working in isolation to complete tasks that have simplistic outcomes. In addition, the Teaching and Learning Implementation Plan (2010 - 2014) of the University of the Western Cape encourages lecturers to explore the potential of technology to bring about changes in teaching and learning practices. The institution acknowledges that technology is increasingly embedded in society, and that in order to engage fully as citizens, UWC graduates must possess not only knowledge and skills that relate to technology, but also have developed a digital literacy that enables them to participate fully in a networked society (University of the Western Cape, 2010).

Taking all of the above into consideration, I set out to create an assignment that would enable me to learn more about integrating technology into learning tasks that aimed to develop characteristics in students that went beyond domain-specific knowledge and skills. The next section of this chapter will present the results of a pilot study that aimed to determine the methods and challenges of integrating technology into teaching and learning practices within this department, using a wiki to facilitate collaborative learning. The chapter also answers the question: How do undergraduate physiotherapy students use a wiki to collaboratively develop content in small groups?

The next section of this chapter has been published as:

Rowe, M. (2012). The use of a wiki to facilitate collaborative learning in a South African physiotherapy department. *South African Journal of Physiotherapy*, 68(2), 11-16.¹⁸

M.R. was responsible for substantial contributions to the conception and design of the project, the acquisition of data, and analysis and interpretation of the results, as well as drafting the article from conception to the final, submitted version.

¹⁸ Communication between the reviewers and the researcher is available in Appendix VI.

6.2. The use of a wiki to facilitate collaborative learning

Abstract

Background: The dominant form of teaching in higher education remains the lecture, even though evidence suggests that it alone is inadequate to facilitate the development of the higher order thinking skills required in clinical practice. The use of wikis may have a role to play in facilitating collaborative learning practices that are important for professional development.

Method: This descriptive survey evaluated the use of a wiki for a collaborative learning activity within small groups of undergraduate physiotherapy students in a South African university. Students participated in a wiki-based assignment and were then surveyed using open- and closed-ended questions to determine their perceptions and experiences of the process.

Results: The results indicate that although a wiki can be used to develop relevant content, there were significant challenges in its implementation. These included a poor understanding by students of how to work effectively in groups, a lack of physical and epistemological access to the internet, and the need for adequate preparation and support. Some features of the wiki were found to have an impact on the quality of the work produced, including the use of Discussion pages, peer review, and the public nature of the wiki.

Conclusion: Wikis may have a role to play in collaborative groupwork, but that students need to be adequately prepared and supported throughout the process.

Keywords: collaboration, education, groupwork, physiotherapy, South Africa, wiki

a) Introduction

Despite evidence that learning is social and a property of interactions between people (Vygotsky 1978; Wenger 1998), the dominant form of teaching today is the traditional lecture, in which knowledge is supposedly “transferred” from the teacher to the student. While lectures can be effective when used in the right context, there is growing evidence to suggest that they may not be the best way to learn, especially if they are poorly implemented (McGarr 2009). Learning is contextual and most effective when the development of knowledge is a product of mutual and creative dialogue that is influenced by the context and culture in which it occurs. However, activities that promote dialogue, collaboration and engagement are often difficult to incorporate into traditional lectures (Magennis & Farrell, 2005). A teaching approach that incorporates opportunities for collaboration and engagement may enhance the teaching and learning process (Magennis & Farrell, 2005; Sharma & Hannafin, 2005).

Social constructivism is a useful lens through which to view collaborative learning, as it emphasises the active construction of knowledge through personally meaningful learning activities that are social in nature. In addition, the approach stresses that multiple perspectives are both valued and necessary, meaning that learning in groups adds value to the personal construction of knowledge (Partlow & Gibbs 2003).

Social constructivist teaching principles may be best applied through the integration of online social spaces within the traditional curriculum. One online tool that is being used increasingly often in healthcare education, is the wiki (Boulos, Maramba & Wheeler, 2006). A wiki is a website that allows the creation of web pages by one or many users who can add, edit and delete online content without requiring any knowledge of HTML.¹⁹ Wikis have no pre-determined format, and can therefore be thought of as flexible spatial structures that can be expanded indefinitely, making them useful platforms for knowledge management. Wikis also contain features that make them well-suited to collaborative work, such as Discussion pages and versioning capabilities that allow one to track a document's evolution over time (Duffy & Bruns, 2006). At their core, wikis are less about technology, and more about collaboration around shared objectives within groups (Lundin, 2008).

¹⁹ Hypertext Markup Language (HTML) is the coding language used to create web pages.

There is therefore evidence to consider the use of wikis as part of a teaching and learning approach that makes use of social constructivist principles. Together with the move towards integrating technology into curricula, the researcher felt that an understanding of students' experiences and perceptions around the use of technology within the curriculum was important before making decisions about larger curriculum changes in that direction. This survey therefore aimed to determine student perceptions of the use of a wiki as part of an assignment to develop content collaboratively in small groups. The objectives of the survey were to determine how students felt about using a wiki to collaboratively develop content as part of their module, to evaluate their perceptions of groupwork while using the wiki, and to determine the challenges of using a wiki in a South African university physiotherapy department.

b) Methods

Research setting and sample

The survey took place in a university physiotherapy department in the Western Cape, South Africa. The sample included all final year physiotherapy students who were registered for the Applied Physiotherapy module during 2009 and consisted of 46 students. Prior to participating in this assignment, students had regular group-based assignments as part of the course. However, none of these had ever included an online component as part of the assignment and all groupwork was done by students in the same physical space.

Assignment design

Historically the module was taught using a lecture format, with assignments being a variation of either individual evidence-based essays or a group-based presentation. For the purpose of this study, a wiki-based assignment was designed, guided by social constructivist principles. Students were required to gather information related to the assessment, treatment and management of common conditions in paediatric patients. An additional objective of the assignment was to develop certain generic graduate attributes, which include an ability to "...actively engage in the generation of...relevant knowledge", as well as being able to "...work in a productive team" (University of the Western Cape, 2009).

Students were randomly split into small groups of 6 members, with each group having to create pages within the wiki as part of their assignment. They were also required to review the work of other groups, using the Discussion feature of the wiki. This review process

included giving advice for improvement of the assignment, as well as providing links to additional resources that would benefit the other groups. The use of a wiki-based assignment that was constructively aligned with the module learning outcomes and university Graduate Attribute policy was thus an appropriate method to collaboratively and critically engage with content and with each other (Biggs, 2012; Jones, 2007).

The wiki was created using Mediawiki, an open-source wiki-engine that is stable, secure and feature rich (Augar, Raitman & Zhou, 2004). The lecturer prepared the students by providing them with a slide presentation demonstrating a step-by-step version of the editing process, creating a video highlighting the features of the wiki, and giving them a handout explaining how to access and edit the wiki. A Help section was also created within the wiki, linking to additional information around formatting, embedding multimedia and referencing within the online platform.

Research design and data analysis

This descriptive survey made use of a self-developed, self-administered questionnaire that was distributed to all students following completion of the assignment. The questionnaire used open- and closed-ended questions to determine students' experiences and perceptions of using the wiki to work together in groups (see Appendix III). Data were captured using OpenOffice.org Calc.

Responses to the closed-ended questions were analysed using frequencies and proportions. The open-ended responses were analysed in order to identify themes that emerged from the data, and qualitative analysis was conducted by two researchers, categorising responses into themes until consensus was reached (Elo & Kyngäs, 2008).

Ethical considerations

Ethical clearance was obtained from the University of the Western Cape's Ethics committee (registration number: 09/8/16), and permission to conduct the survey was given by the head of the physiotherapy department. Students were provided with an information sheet giving the reason for the survey and informed that they were not obliged to participate and would not suffer any negative consequences should they choose not to. Confidentiality was assured by not gathering any personally identifiable information.

c) Results

Forty six questionnaires were distributed to the students and 37 were returned, indicating a response rate of 80%. Nineteen percent (n=7) of respondents were male, and 81% (n=30) were female. The age range for the for the 37 respondents was 21-33 years, with an average of 21 years. Sixty two percent (n=23) of the class had never heard of wikis prior to the assignment and only one student reported having edited one, although every student had used Wikipedia as a resource.

Students reported mixed initial reactions to the assignment, although the overwhelming response was negative (n=29, 78%). The following example quotes are presented from students' responses to the question, "How did you feel when you were told about the wiki-based assignment?":

"Not very excited, because I am not interested in such technology"

"Stressed because I don't like working on the net"

"A bit shocked cause we usually print out our assignments"

Using the wiki to achieve the assignment outcomes

Table 6.2 (below) presents the students' perceptions of their achievement of the assignment objectives.

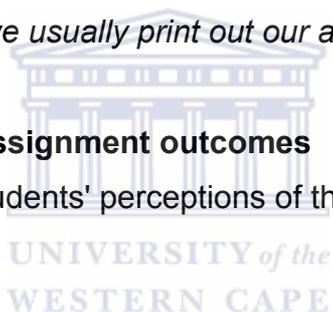


Table 6.2: Students responses around the use of a wiki to achieve the assignment learning outcomes (N=37).

Statement	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
We produced an article that contributed towards my understanding of our topic	7 (19%)	18 (49%)	7 (19%)	5 (14%)	0
We made a useful contribution to the body of knowledge that may help others	5 (14%)	25 (68%)	6 (16%)	1 (1%)	0
Getting feedback and links to further resources helped the group to produce a better quality article	5 (14%)	15 (41%)	13 (35%)	3 (8%)	1 (3%)

It helped me to understand the importance of progressively improving a document through feedback and further research	10 (27%)	25 (68%)	1 (3%)	0	1 (3%)
It helped me to improve my academic writing skills	3 (8%)	17 (46%)	10 (27%)	6 (16%)	1 (3%)

Challenges with group dynamics

This section presents results around the use of the wiki to facilitate collaboration in groups. Most students did not believe that the wiki was a useful way for them to learn in groups. Table 6.3 (below) presents their responses on their perceptions of the use of a wiki for the assignment.

Table 6.3: Respondents' perceptions on the use of a wiki to facilitate collaborative groupwork (N=37).

Statement	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
Using a wiki helped me to learn more about the topic than if I had completed the assignment alone	3 (8%)	7 (19%)	7 (19%)	16 (43%)	4 (11%)
Using a wiki is a good way to work on group assignments and projects	3 (8%)	8 (22%)	16 (43%)	6 (16%)	4 (11%)
Using a wiki encouraged me to work with the others in my group	0	9 (24%)	7 (19%)	18 (49%)	3 (8%)
I feel more confident with groupwork after this assignment	2 (5%)	6 (16%)	11 (30%)	15 (41%)	3 (8%)

However, not all students had poor experiences using the wiki. The following quotes suggest ways in which using a wiki could be useful:

"I think a wiki is useful to do group work, because the group is still able to work collaboratively even if meeting is not possible"

"It is if the members are not in the same geographical location. It also makes time an irrelevant factor"

“...you can work from home in your own time and don't have to find a time when everyone can get together”

Respondents who were not happy with their final assignments (n=11) reported specific problems within their groups, which they reported had resulted in poorer work being produced.²⁰ The following quotes provide some examples of this:

“...only 2 group members mainly contributed so it could have been better had the whole group contributed equally”

“Quality could have been much better but the fact that each person only paid attention to certain parts and no-one proof read the entire document was a problem”

“I felt that our article could have been of a higher quality if each member visited the site more often”

Even though the majority of students blamed low quality work on their peers, when asked to rate their group members' contributions on a scale of 0-10, respondents gave other students the same score, on average, than they gave themselves (7 out of 10).

Poor communication within groups emerged as an important factor in respondents' dissatisfaction with using the wiki. However, few students used the Discussion feature to share ideas or otherwise collaborate during the assignment. The following quotes indicate some of the problems around students' communication:

“We never actually communicated”

“Did not really collaborate, just expanded on their content”

“No one really discussed how the work would be divided. Everyone did their own thing”

Three participants highlighted issues around trust within their particular groups, as can be seen in the following quotes:

“...if we can work with people WE TRUST!!! I hate and do not feel safe working with people I don't know and who don't want to know me”

²⁰ No correlations were done on student perceptions of the quality of their work, and the marks that each group received, since the relationship was not an aim of this study.

“...people would have to take responsibility to pull their own weight and we would have to trust them to do so”

“I felt nervous working with people I do not talk or communicate to”

Peer review aspect of the assignment

Eighty one percent (n=30) responded positively to the peer review component of the assignment, as highlighted by the following quotes:

“Insight and views from more people makes one think more...”

“I thought it was a learning curve because we could help each other understand things that we were clueless about”

“It was good and interesting to hear different view points. I felt challenged and excited by the arguments or agreements to my review”

During the peer review component of the assignment, students commented on the fact that plagiarism was identified as a problem, as highlighted by the following quotes:

“Controlling the quality, ensuring that the content of the assignment was referenced and not plagiarised”

“Trying to sort out the mess and plagiarism”

“People just cutting and pasting content, obvious plagiarism”

In response to the question, “How did you feel knowing your work was visible to the world?”, 40% (n=15) were indifferent, 46% (n=17) were excited and proud, and 14% (n=5) were apprehensive or nervous. As a result of knowing that their work would be publicly visible, 57% (n=21) reported doing more research for this assignment than they would normally have done.

Challenges when working with a wiki

In addition to the problems with groupwork that have already been highlighted, students reported issues around physical access to the internet, as well as a lack of preparation and support during the assignment.

Access to the internet

Lack of internet access featured prominently in students' responses to questions around

the challenges they faced in completing the assignment. Almost half of the participants (48%) accessed the internet from home, just over a quarter from campus (27%), 15% from an internet café and 9% from other locations e.g. a friend or family member's home. Students who did not have access to the internet at home felt that this impacted on their ability to contribute to the assignment, as can be see with the following quotes:

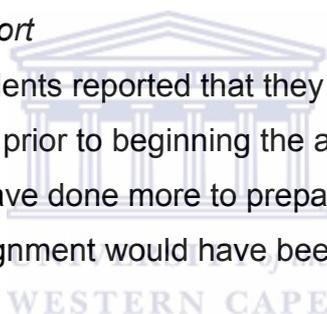
"...I don't have internet at home and it was difficult to go to the internet café"

"...it's very stressful for those of us who have no internet at home. Often computer labs are full and sometimes you won't get a space to complete your assignment. Or the lab closes before I finish my work"

"Obscene amounts of money is spent to use internet cafes and traveling [sic] to campus"

Inadequate preparation and support

Fifty seven percent (n=21) of students reported that they felt that they were not adequately prepared to participate in the wiki prior to beginning the assignment, and thirteen (35%) reported that the lecturer could have done more to prepare them. They suggested that a practical session prior to the assignment would have been useful.



d) Discussion

The aim of this study was to determine students' perceptions of the use of a wiki to develop content collaboratively as part of an Applied Physiotherapy module. In addition, the study sought to evaluate their perceptions of groupwork while using the wiki, and to determine the challenges of using a wiki in a South African university physiotherapy department.

Demographics

These students had very little experience with wikis prior to participating in this assignment, with only one of them reporting having edited one. And, even though they fell into the age-delineated category known as the Net Generation, it was clear that their experiences of using a wiki contrasted with some claims that this cohort of students think and learn differently as a result of digital immersion (Prensky, 2001a). This highlights the fact that care must be taken when using literature to drive educational strategies that occur

in different socio-cultural and historical contexts. We need to consider that not only do these ideas often reflect a North American and European bias, but that the concept of a Net Generation is in itself misleading. The implication that one's date of birth can predict their ability to participate in online spaces ignores the more salient factors such as regional or institutional infrastructure, diversity of the student body, previous educational experiences and socio-economic background (Bennet, Maton & Kervin, 2008; Czerniewicz & Brown, 2005). We should therefore be wary of making assumptions about our students' abilities to participate in online environments like wikis.

Challenges with group dynamics

Most participants were uncertain or disagreed that wikis provided a useful environment for group assignments, or that it helped them to work with others in the group, or that it gave them confidence when working in groups. The respondents who reported that wikis were useful suggested that although they could facilitate collaborative work when participants were geographically separate, there was still a need to meet in person. The students who reported that they had produced a poorer article than they were capable of producing as individuals, highlighted several problems within the group, including inconsistency, differing levels of contribution (even though they gave other group members the same rating for contribution that they gave themselves), lack of structure and established roles within the group. For example, no group leader was selected and so the members fell back on working as individuals with no co-ordinated effort. This was supported by the fact that only 24% (n=9) of participants agreed that the wiki encouraged them to work with other group members. The presence of a leader within wiki-based group assignments has been found to benefit the group in terms of better co-ordinating activities (Ramanau and Geng, 2009).

These respondents seemed unprepared to work in groups and in particular, struggled to engage with each other within the wiki. In addition, even though the lecturer provided some material to help students prepare for the assignment, the lack of a practical session almost certainly had implications for the disconnect in how they used and understood the wiki. The difficulty that the students experienced with groupwork highlights the fact that just because a wiki was used to facilitate collaborative groupwork, collaboration did not arise spontaneously. This confirms the need for consistent facilitation and online presence of a teacher throughout the learning activity (Garrison & Anderson, 2003).

Some group members highlighted a lack of trust impacting their willingness to work within the group. The establishment of roles by the group at the outset may have helped alleviate the lack of trust identified by some of the group members. The role of trust within groups has been found to impact willingness to participate and to share, while communication and face-to-face interaction over time are necessary in order to build trust (Gannon-leary & Fontainha, 2007). In addition, establishing a comfortable and social online space is necessary for cognitive development (Shea & Bidjerano, 2009), which may explain why students who struggled with trust issues within the group found it difficult to work effectively. As educators we must be cognisant of the fact that groupwork requires additional communication strategies and support, and even more so when social cues such as gesture, facial expression and body language, are missing in online communication (Stahl & Hesse, 2006).

Peer review aspect of the assignment

For many of the students, this was the first time that they were working transparently, in the sense that their work could be seen by their peers, their lecturer and the general public. Instead of creating a sense of fear as might be expected, half of these students responded by working harder for this assignment than they normally would. There may be something to be said for introducing students to the notion of being publicly accountable for their work as students, just as they are accountable to the public for the work they do as professionals.

Many respondents agreed that drafting and feedback in the form of comments and links to additional resources were important factors in improving the quality of the work they produced. This may be a result of students seeing their work from others' perspectives (Game and Metcalfe, 2009), as well as the fact that peer review has been identified as a rewarding experience for students (Mak and Coniam, 2008). Even though peer review can be designed to be part of paper-based assignments, it would be difficult to implement on the same scale or with the same convenience.

Another advantage of the drafting and peer review process was the ease with which instances of plagiarism could be identified by the lecturer, and confirmed with a simple search. The lecturer then pointed out the copied text to the group via the Discussion feature of the wiki, along with a link to the original source, included additional resources

explaining plagiarism, and suggestions on how to “clean up” the text. This approach made use of a “connect”, rather than “challenge” model of discourse, which has been shown to help build relationships and trust in online environments (Paulus, 2006).

Challenges when working with a wiki

Access to the internet was highlighted by respondents as being one of the main reasons that they could not participate in the assignment more frequently, with 52% of respondents not having an internet connection of any kind at home.²¹ Even though this was a very small sample size and care should be taken when drawing conclusions, it can be noted that this is in line with a national study that identified a low level of internet access in this population (Rowe and Struthers, 2009). In addition, even though some students were able to access the internet off campus, some highlighted what they felt was a significant financial barrier to more regular access.

Some respondents reported that they were not adequately prepared for the assignment, suggesting that a workshop would have been beneficial. Ramanau and Geng (2009) also found that adequate training of students is essential to the success of projects that make use of social software, like wikis. Competence in the use of emerging technologies is therefore essential in any attempt to integrate social media into teaching practice. Therefore, educators who wish to explore new technologies in the classroom must first provide support and training.

This study found that although a wiki could be used by students to create content as part of a learning activity, they found it difficult to work effectively in their groups. These findings were unexpected in the sense that the researcher had anticipated the students having difficulty with the technology, rather than with groupwork. It was clear from the respondents that the groupwork component of the assignment was for them, the most challenging aspect of all. These findings suggest that while South African healthcare educators should consider integrating technology into their courses, we must understand that using technology does not release us from the fact that sound pedagogy must underlie all curricular design choices.

²¹ It is noted here that the sample of students for this survey was different to the study presented in Chapter Four, which would explain differences in results.

e) Limitations

Since this survey was carried out in one university physiotherapy department with a small number of participants (N=37), the results cannot be generalised to broader contexts. However, these results may still have some value for educators in similar contexts who are interested in exploring wiki-based projects in their own fields.

f) Conclusion and recommendations

Even though this group of students generally reported that they were able to produce relevant content that could be used as a learning resource, they highlighted several challenges with the process. The main difficulty they faced was a poor understanding of effective groupwork, which prevented them from collaborating in the way that a wiki facilitates. The use of feedback and peer review within the wiki was well received by the students, who reported that, together with the fact that the wiki was public, encouraged them to conduct more research than they would usually have done.

In conclusion, the introduction of new teaching and learning tools, like wikis, into the traditional classroom has the potential to enhance teaching and learning practice, but it must be tempered with care and deliberation. If educators are considering the use of social software like wikis, we must ensure that students are well-prepared and supported throughout the process. The use of online tools for collaborative groupwork must be based on a sound pedagogical motivation, and any implementation of technology should seek to enhance, rather than drive, the learning experience.

6.3. Conclusion

Chapter Six presented results that identified some of the challenges that curriculum designers would face when trying to integrate technology to promote collaborative learning. Students reported having a negative experience as a result of several factors, including significant challenges when working together in small groups. Other factors that impacted on the perceived poor success of the experiment included unfamiliarity with technology in general and wikis in particular, a lack of support for students and difficulty with physical access to computers and the internet. The major finding presented in this chapter was that students experienced more challenges as a result of working in groups, than they did with the technology. Even though there is evidence that working in small groups can assist in the development of valuable skills for healthcare practitioners (Albanese, 2000; Kitchen, 2012), most students in this group did not believe that a wiki helped them to learn in groups. In future, I would need to spend significantly more time helping students develop the skills necessary for effective group work, and include sufficient facilitation to help them see the value in working together and sharing ideas.

It was also a concern that students made prodigious use of the copy-and-paste feature of the browser, appropriating significant sections of content from other sources, and including it verbatim in their assignments. There are two problems with this practice; it is academically dishonest, and it negates the opportunity for personally meaningful learning because students are not engaging with the content. While the attribution of other sources is certainly important and was highlighted as a significant aspect of the assignment, the concern during this study was that by simply copying the text from other online sources, students did not engage with the content, and therefore lost out on the opportunity to learn.

While it is easy to castigate students for plagiarism when it is clear that they have copied the work of others and not acknowledged it, we must use caution when jumping to conclusions. I did not relish the thought of accusing my students of academic dishonesty, as I did not believe that they fit into that category. There is evidence to support the idea that students in a digital world may perceive information in ways that are fundamentally opposed to the very concept of plagiarism. In a networked world where so much information is collaboratively developed by many authors, isn't it more like common knowledge than protected intellectual property (Gabriel, 2010)? Students in higher

education often simply do not have the skills to successfully navigate through the academic world, having an often distorted perception of plagiarism that is deeply rooted in an academic literacy that they are cut off from. There is a very real sense that their own thoughts and ideas have little value, and that in order to produce anything of value, students must cut themselves off from their own voices, and merely repeat what others have said (Thompson & Pennycook, 2008).

In a presentation by Catherine Hutchings (2011) from the University of Cape Town, she highlights the following points that were raised by students around the notion of plagiarism, in her study on academic literacy:

- Students experience referencing as feeling of alienation; of not belonging.
- Plagiarism can be experienced as a “trapping stone”, which already sets them up as outcasts or criminals. Academic knowledge is “owned” and “guarded”, and “doesn’t belong to students”.
- Students used “referencing” and “plagiarism” interchangeably.
- Few students understood the purpose of referencing, nor did they understand its language, they often lacked the vocabulary to paraphrase.
- “Seeing is not knowing”...just because it’s been shown to them doesn’t mean they understand it. Teachers told students about plagiarism and therefore assumed that students understood it. Students were often baffled by the language and conventions of citation and referencing.
- “Plagiarism was the only out for me at the time”; there was a sense of being overwhelmed and not being able to cope.
- Students reproduce content as a successful strategy in school, then they come here [to higher education] and are punished when they do the same thing.
- Students don’t always understand the purpose of referencing, only that there is a punishment.

It seems that for many students, dealing with plagiarism as part of their academic identity formation represents a significant challenge for them, and one which is feared because of the sometimes severe punishments meted out (Errey, 2002).

Taking this into account, I decided that a student-centred approach to teaching should avoid the use of the lecturer's power to punish, and should instead seek to create a positive learning space that empowers the student. Rather than reinforcing the idea that plagiarism amounts to cheating or stealing, I used instances of plagiarism to work on building learning relationships with students (Paulus, 2006). Instead of emphasising the “punishment” aspect of plagiarism, I tried to demonstrate that their lack of engagement with the content was evidence of a superficial approach to learning that would not lead to the personal construction of knowledge. If teaching is about creating relationships that lead to student learning, then even instances of plagiarism could be used as learning moments, rather than events that needed to be punished.

In closing this discussion on plagiarism, it should be noted that technology does not in itself lead to plagiarism. Rather, digital technology merely makes copying the work of others more efficient, as was pointed out in this tongue-in-cheek comment during a conversation on Twitter during December, 2011.

> RT @GuyJudge: @timbuckteeth Pencils criticized in plagiarism study. They make it too easy to copy. #pencilchat #



Many students did not use the opportunity to share resources with each other in the spirit of cooperation, but some did, as can be seen in the screenshot of one of the article Discussion pages shown in Illustration 6.1 below.

The screenshot shows a Wikipedia discussion page for "Bronchopulmonary dysplasia". At the top, there are navigation tabs for "page", "discussion", "edit", "history", "delete", "move", "unprotect", and "unwatch". The user "Theboatashore" is logged in, with links for "my talk", "my preferences", "my watchlist", "my contributions", and "log out".

The main content is a list of six numbered points:

1. Here's something to get you started. It's a link to all of my shared bookmarks that I keep online. Whenever I add a bookmark to my browser, this site will get updated. You might find something useful. Good luck. michael rowe
2. I changed your first 4 headings from being just bold text with numbers to actual headings. Please see how I made the changes and correct the rest of your headings. michael rowe
3. Another thing, please press the "Show preview" button (next to the "Save" button) to check your edits before saving. This allows you to make sure that what you want to say is correct before you commit the change. michael rowe
4. You need to work on your references. You must to cite your sources exactly the same as you would with a printed assignment...it's not enough to just paste your URLs into a list. OpenPhysio has a built in citation manager, which you can read about here (under Usage). Please work on correcting the formatting of the references. Otherwise, it's really coming on nicely. michael rowe
5. Your "Risk factors" and "Signs and symptoms" have been cut and paste from somewhere else. Either reference it correctly with quotations or rewrite it and cite your source using and in-text citation (See point 4 above). michael rowe
6. Added disclaimer to article. michael rowe

Below the list is an "Assignment" section with the following text:

Hey guys...good work so far on your assignment

Here are some extra websites for you to visit if you still need information.

For your pathophysiology...Patient UK at (<http://www.patient.co.uk/showdoc/40001888/>) has some other factors that could be involved in the condition. It also has some other information that could be helpful in checking the information you already have.

If you are thinking of putting in an Incidence and/or Prevalence heading, then...Wrong Diagnosis at (http://www.wrongdiagnosis.com/b/bronchopulmonary_dysplasia/prevalence.htm) has some stats for you to look at.

For the medical treatment...some extra information can be found at Milton S. Hershey Medical Centre - College for Medicine (<http://www.hmc.psu.edu/healthinfo/b/bronchopulmonary.htm>) and also at Medline Plus (<http://www.nlm.nih.gov/medlineplus/ency/article/001088.htm>)

Good luck

The page also includes a sidebar with navigation links (Main Page, Community portal, Recent changes, Random page, Help, Donations), a search box, and a toolbox with links (What links here, Related changes, Upload file, Special pages, Printable version, Permanent link).

Illustration 6.1: Example of the Discussion page in the wiki, demonstrating both students and the facilitator providing feedback and sharing resources.

While students may initially resist any attempts to get them to work collaboratively, it should be emphasised to them regardless, taking into consideration that they have had more than ten years of experience in which competitive approaches and ranking have seen them achieve success (i.e. admission into their chosen programme). Why then, should they embrace an approach that is so fundamentally different to competing with others? So, even though there is evidence that improved learning skills will emerge when cooperative, rather than competitive, behaviour is reinforced (Albanese, 2000; Kitchen, 2012), clinical educators must be prepared for student resistance when trying to change their learning behaviour.

There were significant challenges associated with this project, but it also clearly demonstrated that there was potential for students to use technology in innovative ways as part of learning. Transparent workspaces (i.e. conducting work in public) may encourage students to put in more effort as they know that their work is available for anyone in the world to see. Even though their names were obscured from the public, students reported feeling a sense of accountability that made them want to work harder. This accountability is an indicator of authentic learning tasks, in the sense that in the real world, physiotherapists are accountable to the public for the work they do. This assignment also enabled them to participate collaboratively in ways that extended beyond the walls of the

classroom, setting them and their work on an international stage where it continues to exist today. This creation of useful content as part of their learning enabled students to get a glimpse of how they could have an impact in the real world that extended beyond the limited expectations of a rigid curriculum.

Following the outcome of this pilot study, the draft design principles for developing capability are presented below, with changes made based on the study results. In some cases the design principle has been modified as a result of the outcomes of this study or because of new literature, and are emphasised in italics. The original citations and rationales for the initial design principles have been removed. In cases where the principle is unchanged, or was not addressed as part of this study, the right column is blank. In addition, the draft design principles are now grouped within major categories, each named for a top-level principle.



Table 6.4: Draft design principles following the outcomes of the study presented in Chapter Six

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
Interaction	
<p>1a. Encourage communication between people.</p> <p>1b. Integrate peer review and feedback into the activity.</p> <p>1c. Incorporate face-to-face contact.</p>	<p>1b. Students can compare what they understand to what and how others understand. There should be continual drafting with associated feedback that aims to progressively improve the work. Feedback should not be viewed as a final input, but as a conversation between teacher and students, with each having opportunities to contribute.</p> <p>1c. Many aspects of communication are lacking in online spaces, including body language, gestures, and facial expression. Including face-to-face contact time allows students to get to know each other, making the online communication more effective.</p>
Articulation	
<p>2a. Require the articulation of understanding</p> <p>2b. The articulation must be supported with evidence</p> <p>2c. The articulation should be presented in a public space</p>	<p>2b. If “articulation” in this context is viewed as “giving form and structure to understanding”, then unwanted behaviour may be the “articulation” of misunderstanding. For example, if students plagiarise content, view it as an example of misunderstanding that obstructs learning, rather than a behaviour to be punished. Emphasise that if their understanding is supported by evidence, it can withstand stronger challenges.</p> <p>2c. Physiotherapists are accountable to professional bodies and the public. Encouraging students to make statements in public introduces them to the idea that they are accountable for their actions in the world. By working in public they are contributing to the world while at the same time being influenced by it.</p>

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
Complex	
3. Embrace <i>complexity</i> as an integral component of clinical learning.	
Flexible	
4. Are <i>flexible</i> .	<p><i>The learning environment should give students the space to construct and present formal products of learning, but also include spaces for informal interactions that facilitate a process of learning. It should be able to be as big or as small as is necessary. The choice of learning environment should therefore take into account the fact that they should be dynamic and capable of adapting to situations that are changing in the real world.</i></p>
Relationship-centred	
5a. Aim to mediate learning relationships through interaction between people, content and objects.	5b. <i>Working collaboratively requires skills in group dynamics. It may not arise spontaneously and students may actively resist the process. Role allocation is an important part of negotiating responsibility in group-based activities.</i>
5b. <i>Encourage collaborative rather than isolated activity.</i>	
5c. <i>Encourage students to take responsibility for the learning of others.</i>	5c. <i>Establishing trust within the group, possibly with face-to-face activities, can help to develop a sense of community and group cohesion. Giving and taking responsibility for others' learning can help develop trust.</i>
Creative	
6a. Include opportunities for managing knowledge and information.	6b. <i>At least in part, students should work to create content for their own learning. In this way, the content is relevant for them in the real world and serves a purpose that is meaningful for them. By identifying the information they need to solve a clinical problem, students create research questions that aim to address the gap in</i>
6b. <i>Require students to create their own learning materials.</i>	
6c. <i>Students should work on tasks that are iterative.</i>	

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
	<p><i>their knowledge. Information that is personally meaningful to them is more likely to be retained. Therefore, content can be thought of as a framework upon which to develop higher order thinking. Creating their own content also helps to improve their writing skills.</i></p> <p><i>6c. By designing tasks that are iterative, educators create opportunities for feedback and review over a sustained period of time. As a result of this feedback, new content is sought out, filtered, evaluated, summarised, synthesised and articulated.</i></p>
Immersive	
<p>7a. Are <i>immersive</i>, leading students to think as they would in the clinical context.</p> <p>7b. <i>Gradually introduce students to new learning environments.</i></p>	<p><i>7b. Workshops and practical sessions are essential in the early stages, in order to “get the technology out of the way”. Ensure that learning is not negatively impacted by difficulties understanding the technology.</i></p>

It is noted that the major principles that are emerging at this stage of the project are very similar to the characteristics of authentic learning described by Herrington, Reeves and Oliver (2010). This is probably because authentic learning was a significant influence on the development of ideas during this study.

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7. Chapter Seven: Social networks and reflection

Good teachers don't approach a child of this age with overzealousness or with destructive conscientiousness. They're not drill-masters in the military or floor managers in a production system. They are specialists in opening small packages. They give the string a tug but do it carefully. They don't yet know what's in the box. They don't know if it's breakable.

Kozol (2001)

7.1. Introduction

In trying to decide what it means *to be* a health professional, different approaches are being used to describe what they should “look” like. One of the more common approaches is the CanMED's framework, which identifies “the physician”²² as a construction of multiple roles that are described using competencies within each role, and that the relationship between the roles helps inform the understanding of what we want a physician to become (Cooke, Irby, & O'Brien, 2010). However, one of the challenges when using competencies to determine what it means to be a health professional, is that it can lead to a simplification of the role of the practitioner. If being a health professional is dependent simply on the ability *to do*, we risk marginalising the formation of identity during their education with a reduced emphasis on what it means *to be* (Jarvis-Selinger, Pratt & Regehr, 2012). The idea is not to replace competencies, but to add another dimension to education, one that extends the focus from *doing* to *being*. This development occurs at two levels; that of the psychological development of the individual, and of the socialisation of the person into roles and participation within a community (Jarvis-Selinger, Pratt, & Regehr, 2012).

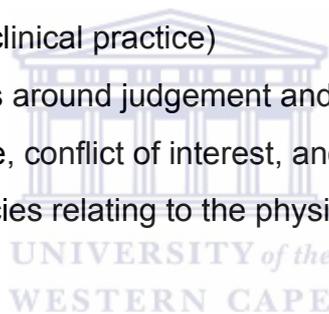
The development of roles as a participant in a community is based in large part on reflection that is practised within that community, yet it is often not included in the formal curriculum. If reflection is to be practised by students, it must be seen to be valued by teachers. In order to promote the idea that reflection is important, we must not only tell students that it is, but be seen to actively engage in the process ourselves. If teachers

²² Although the CanMED's roles were designed with medical physicians in mind, they are similar enough to most healthcare professionals that the framework can be adapted and used to review the roles of any healthcare practitioner.

must model the behaviour and patterns of thinking that we want to see in our students, I asked how I could explicitly model thinking and feeling around clinical experiences, in ways that were interesting and engaging to students?

Using Biggs' (2012) principles of constructive alignment, I designed an assignment in which I could use assisted performance as a teaching approach that operationalised Vygotsky's (1978) social constructivist theory of learning. The assignment was developed as part of the *Professional Ethics in Physiotherapy* module, and had the following learning outcomes:

- Describe and discuss concepts related to the role of human rights in South African healthcare, professionalism and ethics, ethics of care, judgement and moral reasoning and the principles of ethics
- Discuss and debate ways of managing moral and ethical dilemmas in health professional practice (i.e. clinical practice)
- Discuss and debate issues around judgement and moral reasoning, respect for diversity, abuse and torture, conflict of interest, and meaningful life and death
- Describe and discuss policies relating to the physiotherapy profession in South Africa



From the learning outcomes presented above, it is clear that the Professional Ethics module requires students to engage in discussion and debate as part of the module. The outcomes necessitate a change in teaching practice that moves away from lectures and makes use of scenarios and real clinical experiences as a foundation for group discussion. The assessments within the module are also aligned with this teaching approach, and make use of oral examination in small groups, rather than written, knowledge-based examinations. Assignments also require that students explore multiple perspectives of clinical and ethical dilemmas, rather than arriving at any single “correct” answer. Constructive alignment was therefore helpful in guiding the development of learning tasks that were informed by the outcomes of the module.

Assisted performance (Tharp & Gallimore, 1988) was identified as a framework to create an online learning space by providing operational guidelines for teachers that are informed

by social constructivist principles. The framework suggests that teaching be defined as assisted performance and provides a means for teachers to behave in ways that promote student learning. By assisting the student, the teacher is the more knowledgeable other who guides them through the Zone of Proximal Development (Vygotsky, 1978). The following means of assistance can be used by teachers to guide students at key points in their development, without which the student would find it difficult to progress (Tharp & Gallimore, 1988).

- Modelling – the teacher (or, more knowledgeable other) models the desired behaviour for students to imitate
- Contingency management – the teacher rewards desired behaviour through praise and encouragement, or punishes undesired behaviour through reprimand or censure
- Feedback on performance – the teacher provides feedback on student performance with reference to a set of criteria
- Instructing – the teacher gives specific instructions to students, that would facilitate the completion of a task
- Questioning – the teacher asks questions that serve to stimulate further thinking on the part of the student
- Cognitive structuring – the teacher provides a structure for behaviour that helps the student organise their experiences

By using assisted performance, I could provide students with the support and guidance they needed to complete tasks that required them to reflect, individually and with others, on their clinical experiences with the aim of developing clinical and ethical reasoning. In order to create an activity that would provide an opportunity for students to achieve the module learning outcomes, I wanted to use a technology platform that had the following features:

- Students must have the opportunity to articulate a clinical experience
- They must be able to write, edit, save and share a reflection with others
- Students should be able to extend or strengthen their reflections through the use of rich media e.g. audio, video or images could be used to enhance the narrative

- Other students and the facilitator must be able to read those reflections, and comment, or provide feedback to the original author
- Students and the facilitator must be able to share resources with students, in the form of external sources of information that would stimulate further reflection

After taking all of the above into account, I decided a social network could provide a platform for sharing and discussion reflective posts, as well as give the option of creating groups and activity streams. I would, as Rutherford (2010) suggested, create a user-driven social media system as a platform for informal professional development. In this way I would be able to explore how a social network could be used to facilitate conversation and interaction in ways that articulated the culture and language of *being* a physiotherapy professional in clinical practice. In addition to the traditional teacher-to-student interaction found in lectures, Gallimore and Tharp (2002) also argue for activity settings which support different types of interactions between students and teachers. Again, the notion of communication as a mediator of learning is present, which technology is well-suited to provide.

It is clear from the procedure explained above, that the technology did not drive the process. In fact, the technological aspect was the part of the project that was considered last. As always, when considering the use of technology in teaching and learning, the pedagogy must drive the process (Laurillard, 2012). The next section will explore the use of a social network to facilitate students' reflection on clinical practice, using assisted performance as a guiding framework. It aimed to determine the methods and challenges of integrating technology into teaching and learning practices within this department, through the use of an online social network to develop reflective reasoning. It also answered the question: How can an online social network be used to better understand students' perceptions of their clinical experiences, and facilitate reflective reasoning to develop practice knowledge?

The next section of this chapter has been published as:

Rowe, M. (2012). The use of assisted performance within a social network to develop reflective reasoning in undergraduate physiotherapy students. *Medical Teacher*, 34(7), e469-75.²³

²³ Communication between the reviewers and the researcher is available in Appendix VII.

M.R. was responsible for substantial contributions to the conception and design of the project, the acquisition of data, and analysis and interpretation of the results, as well as drafting the article from conception to the final, submitted version.



7.2. The use of assisted performance to develop reflective reasoning

Abstract

Background: The development of practice knowledge is an important component of clinical education and reflective reasoning is known to play a role in its development. Online social networks may have some potential for developing practice knowledge by providing tools for clinical educators to guide students' reasoning practices.

Aim: To determine if an online social network could be used to facilitate reflective reasoning in clinical contexts, as it relates to developing practice knowledge.

Method: The study was conducted within a South African university physiotherapy department, using an online social network to facilitate engagement. Tharp and Gallimore's theory of assisted performance was used as a framework to conduct qualitative analysis of students' reflective blog posts within the network.

Results: The lecturer was able to use strategies within the Assisted Performance framework to facilitate reflection among students. These included modelling, contingency management, feedback, instruction, questioning and cognitive structuring. The features of the social network enabled enhanced communication between teacher and student, as well as promoted engagement around clinical scenarios.

Conclusion: Online social networks can be used to facilitate reflective reasoning as part of the development of practice knowledge by exposing students' understanding of clinical practice. However, careful facilitation using sound pedagogy is still necessary to guide students to deeper understanding.

Keywords: blogging, clinical education, clinical reasoning, ethical reasoning, physiotherapy, social networks

a) Background

The scientific method has helped physiotherapists move from a craft tradition based on experiential knowledge to one based on research and evidence. However, an emphasis on hard science within the healthcare professions does little to take into account the personal, complex and multi-factorial nature of clinical reasoning (Higgs, Richardson & Dahlgren, 2004). Schön (1987) argued that this approach could not in itself effectively develop practice knowledge and emphasised the need for artistry to be developed alongside technical proficiency. In other words, a purely technical approach does not adequately prepare students for the complex reasoning they need to resolve clinical problems (Kember, Ho & Hong, 2008; Strohschein, May & Hagler, 2002). In addition, there is still a systemic problem within health education that emphasises a narrow technical focus that lacks a broader contextual understanding (Frenk et al., 2010).

Practice knowledge should be seen as a dynamic relationship between questions and answers in a context of meaning that is often intuitive and hidden. Indeed, the culture of a profession hides as much from its practitioners as it reveals and if students can be exposed at an early stage to the culture that influences clinical practice (i.e. the language, norms and values of the profession), it may impact on their professional development (Higgs, Richardson & Abrandt Dahlgren, 2004). Developing this practice knowledge is challenging as it requires insight into the reflective and reasoning processes of experienced clinicians. However, there is some evidence that sharing experiences among peers in a collegial environment may go some way towards developing critical reflective thinking (Welch & Dawson, 2006). Unfortunately, there is rarely space in the formal curriculum for the development of these skills.

Human beings learn most effectively in social contexts where they are guided towards higher cognitive functioning by someone who knows more than they do i.e. a more knowledgeable other (MKO). The conceptual distance between what a person understands on their own and what they could potentially understand with guidance, is known as the Zone of Proximal Development (ZPD) and it is within this space that effective teaching and learning takes place (Vygotsky, 1978). In order to help students' development, educators should seek to guide them to a point at which they are able to take over and direct their own learning (Gallimore & Tharp, 1990).

Tharp and Gallimore's (1991) Theory of Assisted Performance provides a framework for teaching activities that help guide the student through their ZPD towards self-regulated learning. Within contextualised learning activities that are grounded in actual experience, the teacher seeks to model desired behaviour, reward and correct student activity, provide feedback on performance, instruct the process, stimulate thoughtful responses through questioning, and create a framework for cognitive development. These activities could be collaborative shared experiences that stimulate “teacher to student”, “student to teacher”, and “student to student” interactions (Gallimore & Tharp, 1991).

In addition, it is becoming more clear that learning is an activity in which students participate in a socio-cultural context, rather than an individualised one (Seely-Brown, Collins & Duguid, 1989). If learning is ideally a communal activity, online communities may be useful places for learners to engage more deeply with content and with each other (Gannon-Leary & Fontainha, 2007). This approach situates learning within social contexts and relationships rather than within individuals, acknowledging that learning derives from social engagement and collaboration (Engeström, 1987). The second generation of the web has created a space for increased interaction, collaboration and creativity that is based on a participatory culture facilitated by online communities (Greenhow, Robelia & Hughes, 2009; Minocha, 2009). There is some evidence that collaborative online tools like wikis and blogs can help expose the upper limits of students' understanding around a subject, thereby allowing a teacher to help them navigate through their individual ZPD (Luckin, 2008). Online social networks can be utilised to promote student interaction and engagement²⁴ with learning materials and with their teachers (Minocha, 2009). However, there is evidence that, rather than using emerging online tools to facilitate the social construction of knowledge, learners still have a tendency to focus their use on gathering content (Farren, 2008; Rowe, 2009).

There are several challenges to be addressed when considering the integration of technology into healthcare education in a South African context. These include poor access to computers and the internet, low levels of digital literacy and socio-economic factors that disadvantage certain groups of students from the outset (Rowe & Struthers, 2009). A previous study within this department also found that students had a poor

²⁴ Engagement = energy devoted to academic activity (Astin, 1984)

understanding of social software and that they did not make effective use of common online tools. However, the same students also expressed being open to new approaches of teaching and learning, as well as a willingness to engage with lecturers outside the time and space of a traditional classroom environment (Rowe, 2009).

These ideas challenge us to find innovative ways of guiding students through a curriculum where the teaching of technical skills and content is only a part of developing professional competence. We must also find ways of helping students to make meaning of their clinical experiences through reflection and knowledge sharing within the often hidden culture of their professional community. Gallimore and Tharp's theory of assisted performance was identified as a framework that could help facilitate the development of reflective reasoning skills among undergraduate physiotherapy students. The aim of this study was therefore to determine if an online social network could be used to expose students' understanding of complex clinical and ethical issues that arose during their clinical practice experiences, and from there to facilitate the reflective reasoning that forms part of the development of practice knowledge.



b) Methods

Setting and sample

The research was conducted among all third and fourth year students (n=70) in a university physiotherapy department during 2010, in the Western Cape, South Africa.

Research design

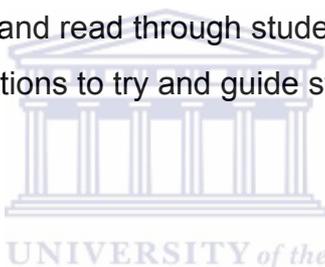
The research design was qualitative in nature, making use of Tharp and Gallimore's Theory of Assisted Performance (1991) as a teaching framework to guide the development of reflective reasoning among students clinical placements. Student-teacher, student-student, and teacher-student interactions were analysed qualitatively by the author, after having been categorised into themes (Elo & Kyngäs, 2008).

Procedure

An online social network was created on a private server using a Wordpress multi-user blogging environment with the Buddypress plugin installed. The network was only accessible by the staff and students within the department, and was therefore not indexed by search engines. It was important for both students and staff to know that their work

would be private. Students and staff within the department were registered as users on the network and participated in a workshop to familiarise themselves with the relevant features of the social networking platform. During the workshop, the students were given assignments that were constructively aligned with the module outcomes of Clinical Practice II and III, as well as the Professional Ethics in Physiotherapy module.

The fourth year students were required to write two reflective posts on their clinical experiences during their clinical placements during the year. The third year students were required to write two reflective posts discussing any ethical dilemmas that they had experienced during their clinical placements. These reflective posts formed the basis of their assignments and were in the form of blogs within the social network. All students were required to read and comment on the posts of others within their year level, throughout the duration of their clinical placements. They were also expected to link to additional media and external sources in order to support their claims and statements. The lecturer took the role of facilitator and read through students' posts, regularly providing comments, suggestions and questions to try and guide students' reflective engagement with their experiences.



Analysis of results

All assignment-related interactions²⁵ within the network were reviewed by the author, taking into account student-student, student-teacher and teacher-student interactions. The posts were analysed thematically and categorised into pre-determined themes based on the Theory of Assisted Performance. The themes included: modelling, contingency management, feedback, instruction, questioning and cognitive structuring. A second reviewer with experience in clinical education was asked to ensure trustworthiness of the analysis.

Ethical considerations

As this study formed part of a larger project on the use of emerging technologies in clinical education, ethical clearance had already been obtained from the University of the Western Cape ethics committee (registration number: 09/8/16) and the head of the physiotherapy department. Although students were required to participate in the assignments as part of

²⁵ Students and staff members also engaged with each other around other assignments and course-related work. These interactions were not reviewed as part of this study.

the continuous assessment of the modules, they did not have to participate in the research that took place afterwards. Students were given full control over their data and gave informed consent for their assignment responses to be used for the analysis. Each potential respondent was given an information sheet that allowed them to make an informed choice about how their data could be used. No students asked for their interactions to be removed prior to the start of the research.

c) Results and discussion

Examples of interactions within the social network are presented below, in order to demonstrate how the Theory of Assisted Performance was used to facilitate the development of clinical and ethical reasoning as part of clinical practice. Each section begins with a statement, and then provides quotes to demonstrate evidence for the statement. Student (S) and facilitator (F) quotes are presented within the pre-determined themes.

Modelling of desired behaviour

The online social network was used by the facilitator to demonstrate to students a structured approach to reflecting on their experiences. In the context of this study, modelling desirable behaviour was taken to mean examples of reflection given by the facilitator (F), in order to demonstrate expectations to students. In the example below, the facilitator responds to a student's reflective post, highlighting their own reflection based on what the student has written. Another student (S) then responds with their own thoughts, ending their comment with their own question to stimulate further discussion.

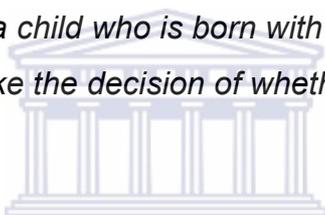
F: "Thank you for an honest and thought-provoking post. I think that the issue you've raised is something that will need a lot of thought and discussion, and is deeply unsettling when we consider the consequences for some people. I'd like to highlight a few thoughts I had when reading your post, and which may serve to stimulate more discussion:

*It's not only children with disabilities who are neglected. I read this story earlier today (URL provided), which really highlights the point
Children with no disabilities bring about enormous changes in lifestyle...kids with disabilities exacerbate this change even more, and some parents just can't cope*

Many parents who can't cope are incredibly frustrated and feel like they have no outlet for their emotions

Having said that, it's never acceptable to neglect or abuse someone, no matter what the supposed reason is. Thanks again for the post."

S: *"This is a very interesting topic and it really makes one think! Firstly, I agree with [F] that it is not only disabled children who are neglected or abused. There are parents who have perfectly healthy, beautiful children but still abuse or neglect them. There are children who are being abused by their fathers or mothers physically every single day. I think that a child who has a loving mother should be given a chance to live no matter what his/her condition is. I read an interesting piece where the author states that "the right to abortion is denying our right to exist" [citation]. This author also makes a point that there are people who become ill during their lifetime and need to receive intensive care, physiotherapy, etc, just like a child who is born with a disability and would need that same care. Can we make the decision of whether a child should live or not?*



In the example above, the conversation was initiated by a reflective post from a student. The facilitator then took that thought and extended it with additional comments, reflections and questions, which were taken up by another student. This highlights that modelling is an important component of any interaction, as students often lack the confidence and understanding of how to structure reflective work. By narrowing the scope of the process through scaffolding, the facilitator can help reduce frustration for the student, assisting them to move towards self-directed learning (Sharma & Hannafin, 2005).

Contingency management

The facilitator used the online social network to praise students behaviour during their clinical placements. The asynchronous nature of the online space allowed for this interaction to be followed up after the event, as well as distributed to the entire class who were separated geographically. In the first interaction below, the facilitator (F) rewards desired behaviour through praise and encouragement. This is followed by an example of a different member of staff (F2) giving a student praise in another scenario.

F1: *“Hi there...I would like to make an announcement to this group. I invited 2 of your classmates to conduct an exercise class to a group of elderly people...The feedback from the group about the professionalism of the one student who conducted the class was amazing. Everyone was thrilled at how the class was conducted, the concern displayed for participants throughout the session and the continuous education and advice received. As a professor of this department I was proud to be associated with students of such a high calibre. WELL DONE and THANK YOU for making [us] proud.”*

F2: *“...congratulations on a job well done. You noticed something important that everyone else on the team had missed. The patient may be alive today because you picked up on that one small point. That fact that someone else took the credit misses the point. You did something great, and made a real, objective difference in a patient’s life.”*

In the above examples, it is clear that the online social network facilitated an exchange between staff and students in which students were openly congratulated for their professional behaviour. Students often feel that their role within the health system is undervalued at best, and merely tolerated at worst, when in fact they have the potential to play an important role (Nilsson, Pennbrant, Pilhammar, & Wenestam, 2010). Their development as clinicians relies in part not only on their understanding of their role within the multidisciplinary team but also in terms of the value that they perceive they bring to it. Encouraging students' contributions to patient management develops their confidence in terms of continuing to make those contributions.

Providing feedback to students

The facilitator was able to effectively use the commenting feature of the online social network to provide regular and consistent feedback to all students, regardless of where they were placed. Two of the major issues that arose during the assignments was that students often felt uncertain that they had made appropriate decisions around patient management and potential conflict with others members of the team. Providing feedback is one of the most effective means of assisting students in their formative progress but it is often neglected (Chowdhury & Kalu, 2004). In the examples given below, the facilitator used student posts as opportunities to give feedback on their original reflections whereby

they were questioning certain actions they had taken within the clinical context.

F: “Nice comments. You’ve definitely looked at many alternatives and considered the outcomes of each. And I think the way you began your comment sums it up...”Is it really that simple”? I think you showed clearly that it’s not. Well done.”

“I like the way you handled the situation. Making the call from the nurses station made your point way more powerfully than if you had merely confronted the nurse. Well done for both doing the right thing, but also doing it in a way that didn’t lead to confrontation.”

“Well done for standing up for yourself. It’s OK to disagree with someone else...As long as you’re respectful, you’re free to disagree with other members of the team.”



Students viewed this assignment as an opportunity to seek validation with regards their decision-making processes around patient management and teamwork. In fact, writing about their clinical decisions has been demonstrated to help students develop a deeper understanding of their interactions with patients and colleagues (Williams, Wessel, Gemus & Foster-Sargeant, 2002). It was clear from their posts that students needed to feel that an appropriate clinical decision was made thereby, helping them to feel that they were contributing something useful to the team.

Instructing the learning and reflective processes

The online social network was effective in allowing the facilitator to convey instructions to the students, both prior to, and during the assignment. The facilitator gave the students information on the tasks to be undertaken as part of the assignment, both within the social network and as a handout in class during the workshop. In addition, further instructions were posted online as questions arose, using a “just-in-time” approach to provide relevant information to students as they needed it (Higdon & Topaz, 2009). This was done to prevent overloading the students with information that may or may not have been important to them in the beginning (Greenhalgh, 2001). In the example given below, the instructions were related to technical problems that several of the students had

encountered and that they subsequently asked about.

F: *“Hi everyone. Here’s a quick note on how to add hyperlinks to your blog posts...*

- Copy the URL (the bit of text at the top of your browser that begins with “http://www...”) of the page you want to link to i.e. the external source you want to use

- Highlight the word / phrase in your blog post that you want to use to create the link...[remainder of instructions left out for the sake of brevity]

Let me know if you have any problems”

In the example above, the instructions to the students can be seen as a voice directly telling them to “do” something, which is important in order for them to develop their own voices as self-directed learners (Tharp & Gallimore, 1991). As the student develops their capacity for filling in the gaps in their own knowledge, the direct instructions of the facilitator can be reduced. This scaffolding can then be reduced as the student develops a better understanding of the process (Sharma & Hannafin, 2005).

Stimulate thoughtful responses through questioning of the

The facilitator used thoughtful questions in an attempt to encourage further reflection, creative responses and alternative viewpoints from the students. This strategy is used not to elicit information from students, but rather to expose the logic of one's thinking process in order to stimulate critical, independent thinking (Paul, 1990). In the first example below, the student has made a statement in response to a situation they had encountered. The facilitator then uses questioning to highlight some of the issues that the student has not considered as part of the original post. In the second example, the facilitator poses question that might challenge the students' thinking around deeply held belief systems. Again, the idea is not to elicit actual information but rather to have students expose their own thinking to critical reflection within the context of the online social network (Sharma & Hannafin, 2005).

S: *“I personally feel that in a country like South Africa at times when done in the first trimester abortion is the right option and the mother and father should have this option available to them. Poverty is a big problem in this country and often*

unwanted babies are left of [sic] the streets or worse to die...” [remainder of the post left out for the sake brevity]

F: *“Nice idea [S], I’m looking forward to this conversation. I have a few questions for the group. 1) Is it appropriate for the father to have a right to assert his beliefs re. the reproductive health of the mother? What happens in cultures when the women is subservient to the man? Will he have the only say in the matter? What does the [South African] constitution say about this (i.e. what is the legal stance)? Is poverty a reasonable reason to consider having an abortion? What other reasons can you come up with?”*

F: [In response to a students' statement about the role of religion and culture in ethical decision-making] *“But religion (or any other belief) makes something “right” or “wrong”, so how can [we] not take it into account?...We’re trying to be objective so that we can treat everyone fairly, but for many people it’s impossible to be objective because their beliefs run so deeply and they feel them so strongly. Can we ignore the beliefs of others? Should we?”*

The questioning from the facilitator highlighted in the examples above led to further reflective posts from the original students, as well as from other students who then joined the conversation. The use of questions allowed the facilitator to develop a better sense of students' level of understanding, while at the same time involving them in the construction of their own knowledge (Graffam, 2007). The social network was therefore used effectively to elicit critical reflection by posing questions in response to students' blog posts and comments.

Create a framework for cognitive development

The nature of the online social network allowed students to pose complex clinical scenarios that they had experienced, and for the facilitator to then help guide the students' thinking process around the resolution of the problem. The facilitator tried to provide a framework for thinking and acting in order to develop a cognitive structure for the students to establish conceptual relationships between ideas. This then helped the student to move forward and resolve the particular problem they were having. In the example below, the student has asked for help in how they should have dealt with a complex situation on the

ward. The facilitator then used the opportunity to explain how they would have acted in the same scenario, thus exposing their clinical reasoning and thinking processes to the student.

F: "This is a very difficult situation to have found yourself in and there are no easy answers. I agree with what you say about giving the mother (your references are all about the patient, not the family / guardian) realistic expectations of the outcome...I would've first gone to the nurse / doctor and asked for a patient prognosis / update. Then I would've gone to the mother and said something like the following (obviously this is shortened):

- Mrs. so-and-so, this is what has happened to your baby...*
- These are the probable outcomes...*
- However, without having all the information, recovery is also possible, although the chances are small...*
- Do you have any questions? Is there anything I've said that you don't understand?*

Often, families (and patients) just want to know what is going on. Doctors and nurses often don't have the time to spend explaining things to relevant stakeholders, and it falls to allied health professionals to do this. i [sic] think it's important for a patient's family to have the time to prepare themselves for the worst outcome, while at the same time being open to the best outcome. Thanks for sharing this story."

In the above example, the facilitator provided a framework for the student to help them get a better understanding of the clinical problem they had encountered. It was also clear that the students struggled to find relevant and authoritative content that they could use to develop their own knowledge and understanding. The online social network made it easy to provide students with links to relevant content that would address the problems they identified, but it could also be accompanied with context from the facilitator rather than just a link to content.

d) Limitations and recommendations

Care should be taken to not over-interpret the results of the study and conclude that students' understanding and clinical reasoning was actually improved. Quantitative outcomes were not evaluated, so while the study demonstrated that it was possible to use an online social network as a platform for developing reflective practice, further research is needed to determine whether or not social networks have a role to play in the development of real clinical competence. It would also have been useful to include a short survey following completion of the assignment, in order to evaluate students' perceptions of the process. This may have provided insightful information in terms of improving the process for any further studies in this domain.

It should also be noted that although students self-report was that they were regular users of online social networks in the context of their social lives, this didn't transfer well into the educational context. Significant feedback was required by the facilitator in order to guide students in terms of referencing, structure of their posts and using features of the network to strengthen their arguments (e.g. by embedding images, or linking to external sources). The workshop held at the beginning of the assignment was essential for many students to get a better understanding of how to use the network. Educators should not make assumptions about students' ability to engage with each other using online social networks. In addition, any use of a technology for teaching and learning should take place within the context of a constructively aligned task, rather than merely for its own sake.

Finally, it would have been useful to have students from both year levels read and comment on the posts of students in other classes i.e. for the third year students to read and comment on fourth year experiences. This may help them to prepare for the challenges to be expected in their final year. It would also give the fourth year students opportunities to provide feedback to third years, helping to guide the less experienced students by using their own personal experiences.

e) Conclusion

It seems that online social networks can be used to facilitate teaching and learning in the context of clinical education, even among students with limited internet access in a resource-constrained environment. However, constructive alignment of the learning task and its assessment must be integrated with effective teaching practices in order to bring

this about, and a focus on the technology misses the point. Using this framework (i.e. the Theory of Assisted Performance) within a social network clearly demonstrated that online social networks can be used to develop reflective practices among undergraduate physiotherapy students. It also helped expose individual students' levels of knowledge and understanding of complex clinical situations, thereby allowing the teacher to guide them through their ZPD towards a deeper understanding of appropriate professional responses. In addition, the features of the social network made it relatively simple to engage with students in an active, dynamic system that allowed for multiple viewpoints and perspectives to be integrated. Clinical educators should therefore consider the use of online social networks to facilitate the reflective practices that are so important in the development of practice knowledge among healthcare professionals.



7.3. Reflective practice during this pilot study

Using principles of action research during this project meant that I had to evaluate my own responses to study outcomes and processes, and be mindful of the impact that would have as I moved forward. I blogged frequently as part of this introspection, and share an example below to highlight one of the challenges I experienced during this project, and is followed by responses from two international PhD students. This illustrates the difficulty I had being part of the process, while simultaneously evaluating it (Cohen, Manion, & Morrison, 2000). I was driven by a desire to objectively describe the outcome of the studies, but I also really wanted them to be successful. The tension that I experienced is presented here as a blog post that I wrote during the design and implementation of the social networking project described in Chapter Seven.²⁶



²⁶ Personal attachment to research (March 11, 2010). Available at <http://www.mrowe.co.za/blog/2010/03/personal-attachment-to-research/>

Exploring clinical education at a South African university

[Home](#) » [2010](#) » [March](#) » [Personal attachment to research](#)

PERSONAL ATTACHMENT TO RESEARCH

March 11, 2010 · by Michael Rowe · in [research](#) · [Edit](#)

Yesterday I had a meeting with my supervisor to discuss the assignments I'm going to run as part of the first objective of my PhD. Together with a systematic review and a survey, I was interested in using student and staff participation in a social network to derive additional data that would help me form a baseline understanding of their attitudes and skills around teaching and learning practice, as well as establish the level of digital and information literacy within the department.

After joining the SAFRI programme, I incorporated the social network idea into my SAFRI project, but unconsciously ended up with a different agenda. Instead of using the network to highlight potential problem areas and the challenges of teaching with technology, it morphed into me trying to demonstrate the effectiveness of using a social network to facilitate reflective practice. In hindsight, it's clear that the 2 projects were at odds with one another, and the objectives were definitely not aligned.

When my supervisor pointed out that there was inconsistency in the 2 projects I really struggled to accept it. I was adamant that my methods were fine and she suggested that I hand over facilitation of the assignments within the network to other staff who didn't have such a high personal stake in the success of the project, and I strongly disagreed. I found several reasons to explain why I had to be the person to run it, the strongest of which was that "...no-one else will try as hard as I will to make sure it works". Which kind of made her point.

When I went away and thought about our conversation I reviewed my objectives for the 2 projects, and then it was clear that they really were 2 different projects. One was suggesting that this would be a useful tool to describe the current state of affairs, which I know will be less than ideal. The other was

Illustration 7.1: A personal reflection on the research process during the social networking project.

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- [Michael Rowe](#) on [Peer review of teaching](#)
- [Carina](#) on [Peer review of teaching](#)



Cristina March 11, 2010 at 22:51 · Edit ·

Interesting what you are saying about the researcher. As part of my research paradigm I am seeing the researcher as an integral part of the research. And I am facing the fear of how far I am going to let my perspectives as a practitioner (and a tech enthusiast) influence my research views... time will tell. But this was a good lesson for you, and a good one for me too. Something I need to bear in mind...all the time. I hope to start my field research soon, and that does scare the 'heck' out of me.

as for thinking that with you the project would be so much better because you would work harder at it... of course!!!! I can also relate to it. It's or baby. We want it to be perfect. No one will ever love it as much as we do...

But with the time I've also learned to be more patient....mind you, still learning!...and let people bloom in the new environment we introduce them to, while slowly providing some food for thought, some triggers for them to engage. When it comes to 'convincing' people to using tech, or just the fact of working with people, no outcome can be predicted...

They need to convince themselves... But having inspiring people guiding the way does help.

Best of luck. It will be great. No learning path is perfect. I am at crossroads all the time... trying to decide where to go next.

Keep blogging. It helps us too.



Gareth March 11, 2010 at 14:12 · Edit ·

You're bang on there. I have a real problem with getting over enthused about projects, including social media, and wanting them to succeed just so the world can see what a brilliant person I am. The reality is the project doesn't need it to be, and the world doesn't really care that much what I throw at it no matter how hard I try. I blame the perfectionist side of my personality for creeping out but its time to kick that into touch now.

Good luck with your project(s), I'm sure you'll be fine and you sound like you have enough

Illustration 7.2: Comments on my blog from two international PhD students who offered insight and encouragement.

After having posted the reflection and read through the comments, I was able to reflect further on the dilemma I experienced and came to the conclusion that I needed to be okay with the possibility of sharing the responsibility for driving the process with others. This acceptance of the need to share responsibility during the implementation of the blended learning module, would turn out to be a significant factor later on (see Chapter Nine – Creating and implementing the blended learning module).

This example of blogging demonstrates the importance of keeping a reflective diary during the research process, which is well known and regarded as completely acceptable and necessary among academics. What is not as acceptable is the use of blogging as the medium for this reflection. There is an (albeit slow) increase in the use of blogging by academics as a way of participating in a public conversation, providing examples of practice for others, engaging with colleagues, testing ideas, and challenging the ideas of others (Maslen, 2011). While there is definitely some resistance to the idea, what can't be argued is that blogs create an online, public space for the sharing and often robust discussion of ideas and opinion (Davidson, 2011).

In addition to providing a resource for both other academics and the public in general, blogging is another communication channel for academics to establish themselves in a niche research area. Novice researchers now have an opportunity to begin participating in the conversation much earlier than their well-established colleagues (Silva, 2012). Prior to the availability of freely available, open source publication platforms, it could take years for an academic to become known in their field. With the emergence of publication tools via the internet, academics now have the opportunity to engage in a public discourse in their field, almost instantaneously. Taken in this context, it seems that blogs have an important role to play in universities and society in general, by enabling academics to disseminate knowledge for their own benefit, the promotion of the institution, and as a resource for the community.

7.4. Conclusion

Chapter Seven presented evidence supporting the potential of emerging online technology in the form of a social network to facilitate the development of non-technical skills like reflection and clinical reasoning. However, it was important that the online learning space was integrated with offline clinical experiences. In other words, the learning tasks that were completed on the social network, were grounded in real world experiences, the outcomes of which were relevant to the students. This authentic learning environment enabled them to participate in a process of learning without perceiving it as a separate and isolated activity, removed from their clinical experiences. See Illustration 7.3 below for an example of the kinds of reflections that students were posting during their clinical rotations.





by [redacted]

Allocation of scarce resources

August 28, 2010 in [Uncategorized](#)

[Edit this entry](#)

While working in an environment, like the community block that I am currently placed at, that is considered poor and lacks essential medical resources, the rationing of medical resources is a necessary evil. This ethical challenge persists not only in this small community, but it's a problem everywhere.

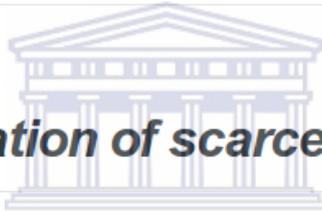
This topic was brought to my attention when I was at a school for disabled children in the community and saw that a few children were in wheelchairs and some were not. When I asked why the other kids were just lying on the mat on the floor, I was told that the school could not afford to buy more wheelchairs. Another scarce "resource" was care takers and physiotherapists. There are currently 18 children, with only 2 care takers. The care takers are so busy that by the time they finished serving breakfast it would be time for lunch and then they would have to start all over again. Then the physiotherapist only comes around a couple of times a year. And when she is there who should the physiotherapist spend time with if all the kids desperately need attention? And how does one decide who must get treated? Should you follow a sickest-first rule, or first-come-first-serve rule, or should you focus on those kids with the better prognosis?

My dilemma: who decides which patients should get what? Is there a criteria involved in making this decision?!

Tags: [dilemma](#), [ethics](#), [patient rights](#), [resources](#)

[← Informed Consent](#)

[Patient's rights?!@? →](#)



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1 response to *Allocation of scarce resources*



[redacted] said on [August 30, 2010](#)

Hey.

I think it's so sad that at a place specifically designed to be a haven for children with disabilities can be so neglected. As a student (on a community block) we are not allowed to see patients, I think a good idea for future groups would be to look into making the people in the community aware of the situation and bring to light the importance of such a

Illustration 7.3: Example of a student reflection on the social network, together with a response from a peer.

By sharing their experiences with each other, students were able to provide support for each other, especially when it came to validating difficult choices they had made. Students also reported feeling isolated from clinicians and were reluctant to ask them if they had made the "correct" decision, because they felt that they were supposed to "just know" what to do. The social network gave them a safe place where they could explain the context of their experience, and get feedback from their peers in ways that they did not perceive to be judgemental.

As the facilitator of the project, I spent a lot of time commenting on students' posts and sharing my own experiences and thoughts after reading their posts, I exposed them to ways of thinking and being that a clinician goes through when presented with a clinical problem or ethical dilemma. By articulating and making explicit this thinking process, I modelled the language and culture of the profession, highlighting to students what it was like *to be* and think like a physiotherapist. This introduced students to a way of thinking about the clinical context that went beyond knowing facts and skills, towards a process of becoming, through thoughtful reflection and questioning. The emphasis on the ethical dimensions of the assignment in relation to clinical practice demonstrated to students that professional practice went further than knowing what they needed to do and to know. Illustration 7.4 below presents a conversation between myself and two students, around the emotional response that one felt when she learned about the physical abuse that is often experienced by children with disabilities.



posted an update in the group  **3rd year ethics assignment (2010): 2 years, 1 month ago**

Hi all, this was just one of my many thoughts

Aborting a child during the prenatal phase or neglecting/abandoning them at the postnatal phase because they are mentally handicapped (M.H.) and/or physically disabled?

I have been seriously thinking about this and while working on a paediatrics block it has crossed my mind several times. I am very... [\[Read more\]](#)

[Comment](#) **5** [Favorite](#) [Delete](#) [Like](#) [Spam](#)



replied 2 years, 1 month ago

Thank you for an honest and thought-provoking post. I think that the issue you've raised is something that will need a lot of thought and discussion, and is deeply unsettling when we consider the consequences for some people. I'd like to highlight a few thoughts I had when reading your post, and which may serve to stimulate more discussion:

1. It's not only children with disabilities who are neglected. I read this story earlier today (<http://bit.ly/azAyrcc>), which really highlights the point
2. Children with no disabilities bring about enormous changes in lifestyle...kids with disabilities exacerbate this change even more, and some parents just can't cope
3. Many parents who can't cope are incredibly frustrated and feel like they have no outlet for their emotions
4. Having said that, it's never acceptable to neglect or abuse someone, no matter what the supposed reason is

Thanks again for the post.

[Reply](#) [Delete](#) [Spam](#)



replied 2 years, 1 month ago

Hey :-)

This is a very interesting topic and it really makes one think! Firstly, I agree with Michael that it is not only disabled children who are neglected or abused. There are parents who have perfectly healthy, beautiful children but still abuse or neglect them. There are children who are being abused by their fathers or mothers... [\[Read more\]](#)

Illustration 7.4: A series of comments highlighting the different types of interaction between facilitator, content (the URL), and another student.

In addition to commenting on students reflections, and sharing my own thoughts, the social network became a source of information for students to refer to, as can be seen in Illustration 7.5 below. The information was only shared when the need for it arose, showing how the platform was flexible enough to provide what the student needed, when it was needed. The use of tags and categories made it simple for students to find content that was relevant for them, be it a shared clinical experience, or links to external sources of

information.



posted a new activity comment: 10 months, 4 weeks ago · [View](#) · [Delete](#) · [Edit](#)

First, some background information. Here's the Wikipedia article on X-rays (projectional radiography), and another Wikipedia article, specifically on chest X-rays (http://en.wikipedia.org/wiki/Chest_radiograph). Neither of these has extensive images but provide good context for understanding X-rays in general.

Now, the images. Here's a fantastic image database of chest X-rays that is freely available (http://www.meddean.luc.edu/lumen/MedEd/medicine/pulmonar/cxr/atlas/cxratlas_f.htm). For a more basic review of chest images, try http://rad.usuhs.mil/rad/chest_review/index.html. It's also pretty decent and although it isn't nearly as comprehensive as the first one, it's probably a good place to start.

Moving on, here are some really good articles on common respiratory conditions (some of these may have images, but they're generally medical descriptions of disease processes) <http://emedicine.medscape.com/radiology#chest>

Hope this helps. Please share these resources with others who might also be having respiratory problems (did you see what I did there?).

[Favorite](#) [Like](#)

↳ In reply to - [\[redacted\]](#) wrote a new blog post: [Help with X-Rays](#) Does anyone have a bank of X-rays we can have a look at? I'm finding it very difficult to read the X-rays we see for Respiratory Pts. I am referring to books, but its different from looking at the real thing. Even the ones we saw in [...] · [View](#)



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Illustration 7.5 Example of using the social network as a source of information to students.

One of the major challenges I experienced during this project was the enormous amount of time that was needed to provide feedback to every student as they posted their reflections. The idea was that the feedback would be part of the activity, and not something tacked on at the end. However, this meant that I needed to be alert for posts so that I could respond to them reasonably soon. I had not considered this when designing the assignment, and without setting aside time as part of my work flow, I soon fell behind with their feedback. In future, online interaction would need to be integrated with the normal timetable, to ensure that students would not feel alone as they posted their reflections. In addition, we could emphasise peer feedback as a formal part of the process, which would mean that the full responsibility for providing feedback would not be on the lecturer.

In conclusion, Chapter Seven showed that I could use technology that was integrated into an undergraduate physiotherapy module to develop reflective reasoning skills as part of clinical practice. However, the clinical and reflective reasoning process needed to be facilitated, or guided by a more knowledgeable other (Vygotsky, 1978). The students needed stimulating questioning and comments to prompt them to take further steps in their reflections. It was this interaction between teacher, student and content that brought about changes in how students perceived their clinical experiences. In essence, this pilot study demonstrated clearly that the role of the teacher, or facilitator, was absolutely essential when trying to integrate technology to bring about changes in teaching and learning practices. If we would like students to go further than simply knowing a set of facts and procedures, we must create learning opportunities that facilitate professional development, by introducing them to the language, values and social norms of the profession. In other words, we must create learning environments that immerse the student in the culture of the profession, where facilitators are active participants in a process of learning.

Table 7.1 below presents an updated version of the draft design principles, with changes highlighted as a result of this study.

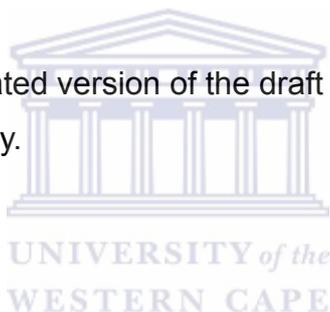


Table 7.1: Draft design principles following the outcomes of the study presented in Chapter Seven

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
Interaction	
<p>1a. Encourage <i>both synchronous and asynchronous</i> communication between people.</p> <p>1b. <i>Require</i> peer review and feedback <i>as part of</i> the activity.</p> <p>1c. Incorporate face-to-face contact.</p> <p>1d. <i>Students can also interact with content.</i></p> <p>1e. <i>Move interactions outside the classroom.</i></p>	<p>1a. <i>The learning environment should enable students and lecturers to communicate both synchronously and asynchronously.</i></p> <p>1b. <i>Students should be active participants the process, providing each other with feedback and assistance, together with the facilitator. This feedback takes place throughout the process, not just at the end.</i></p> <p>1d. <i>Content can be responsive. Or interactions with content provoke deeper thinking or reflection. Content is not passive, or inert. Interacting with the content and with others does something to the student. Learning “happens” in social contexts and relationships, rather than within individuals (Engestrom, 1987).</i></p> <p>1e. <i>Move learning outside the classroom, beyond the boundaries of time and space. Learning anywhere, any time. Changing culture, understanding of learning as a thing that happens at any time, not just during class.</i></p>
Articulation	
<p>2a. Require the articulation of understanding.</p> <p>2b. The articulation must be supported with evidence, <i>and stated as an argument.</i></p> <p>2c. The articulation should be presented in a public space, to</p>	<p>2b. <i>Students state their position (e.g. “I think that...because...”) and can be then be challenged if the logic within the argument is inconsistent.</i></p> <p>2c. <i>Students need to know when they have made the correct choices, or how they can avoid making the wrong ones. Validation</i></p>

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
<p><i>enable them to be challenged (or praised, or validated).</i></p> <p><i>2d. Challenges to students thinking processes should be in the form of a question.</i></p> <p><i>2e. It should be based on a personal experience.</i></p>	<p><i>of performance is reassuring and helps to create a stable foundation up on which to build future knowledge.</i></p> <p><i>2d. When feedback is given to students as part of the process, and it is perceived as an input into their learning (rather than a criticism of their performance or knowledge). It should be in the form of a question, which is not asked to elicit information, but rather to expose the logic of their thinking (e.g. “Can you explain to me why you think that?”)</i></p> <p><i>2e. When the articulated thought is based on their own experience and they are subsequently provided with options for action that encourage them to change their behaviour, actions, thinking, etc. as part of the task, they are encouraged to act on it and create change in the real world. The activity should therefore have real world relevance and not be an isolated, separate task that is accomplished for no other reason than that it is part of the curriculum.</i></p>
Complex	
<p><i>3a. Embrace complexity as an integral component of clinical learning.</i></p> <p><i>3b. Activities should have poorly-defined boundaries that do not lend themselves to simple solutions.</i></p> <p><i>3c. Activities should be difficult to solve working as individuals.</i></p>	<p><i>3b. Clinical practice (and health systems in general) are complex, and include “messy” problems that do not conform to simple subject boundaries (Seely-Brown, Collins, & Duguid, 1989; Schon, 1987). Avoid an approach that isolates the activity from the context in which it exists in the real world. If students must think and behave as practitioners, then the activity should encourage this.</i></p> <p><i>3c. Patient management is rarely an isolated activity. The clinical context is complex, with healthcare practitioners relying on many other members of the team to provide results and other information</i></p>

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
<i>that the physiotherapist needs to successfully manage the patient.</i>	
Reflective	
<p><i>4a. Reflection is an integral part of the task</i></p> <p><i>4b. Lecturers must model reflection in- and on-action</i></p>	<p><i>4a. Reflection is part of the activity, and as such, has an inherent value in that it is required in order to successfully complete the activity. In this way, the outcome of the reflection has a consequence for students that ensures that it is taken seriously.</i></p> <p><i>4b. When lecturers model the reflective process, they are demonstrating a way of thinking about, and acting, as a professional. They provide a scaffold for students, not only showing them how to reflect, but that it is an important aspect of professional development and learning.</i></p>
Flexible	
<p><i>5a. The learning environments (physical and online) should be flexible, but also include structure.</i></p> <p><i>5b. Flexible content.</i></p> <p><i>5c. Flexible lecturers and students.</i></p> <p><i>5d. Flexible curriculum.</i></p>	<p><i>5a. Structuring the learning environment serves to narrow the scope of possible outcomes. This structure allows tasks to be graded, or scaffolded, so that students have something firm upon which they can build. Learning activities can change in response to students' needs as they move through different learning experiences. Structure can be provided by giving students instructions for completing tasks, which is useful in the early stages when they need an external voice telling them what to do, while they develop their own voices as self-directed learners.</i></p> <p><i>5a. The learning environment should not constrain the opportunities for learning that arise from developments that happen in the real world. If a student needs to share or discuss a clinical experience, the technology platform should be able to respond to that emergent need, even if it was not the original intended outcome of the activity.</i></p>

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
	<p><i>The learning environment must be adaptable, changing to take into account the changing reality of the clinical world. Students experiences in the clinical context change, so the online space must change with them.</i></p> <p><i>5b. Content can be added, removed, adapted as students' understanding is articulated and better understood by the lecturers. Gaps in understanding can be addressed by changing the content and learning activities.</i></p> <p><i>5c. The role of the facilitator changes in response to students' learning needs</i></p> <p><i>5d. Flexible boundaries between allows 4th year students to respond to 3rd year challenges. More experienced students guiding those with less experience. Preparation for the next year of study. Boundaries of the tasks should be flexible, allowing movement of conversations and interactions between different classes, groups, subjects, etc. Supports "just-in-time" learning by being able to respond to student experiences and questions as they are reported.</i></p>
Relationship-centred	
<p>6a. Aim to mediate learning relationships through interaction between people, content and objects.</p> <p>6b. Encourage collaborative rather than isolated activity.</p> <p>6c. Responsibility for learning <i>must be shared with others.</i></p> <p><i>6d. Facilitators are active participants in completing the activity.</i></p>	<p><i>6c. Peer feedback provides validation for clinical and ethical choices made, even though the facilitator must check what students say. Validating students and peers experiences makes them students feel as if they are a becoming an active member and participant in the profession.</i></p> <p><i>6d. Facilitators must be active participants in the task. We can't just give students the task to complete, because we must engage with</i></p>

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
<p>6e. <i>Emphasise that students are valued participants in the process of teaching and learning.</i></p>	<p><i>them in order for them to complete it. It must be hard for them to do alone / there is hidden, tacit knowledge that we have that we must expose to students to model behaviour / thinking patterns. We therefore can't be outsiders, or objective markers of their products. We must be participants in a process that they are going through. Not an independent observer. Lecturers must model the thinking and behaviour they want to see in students.</i></p> <p><i>6e. Teaching and learning is a symbiotic relationship, with each party dependent on the other. Students are not passive recipients of knowledge and lecturers are not content delivery mechanisms. "Teaching and learning" is a relationship between people.</i></p>
Creative	
<p>7a. Include opportunities for managing knowledge and information.</p> <p>7b. Require students to create <i>some of</i> their own learning materials.</p> <p>7c. Students should work on tasks that are iterative.</p> <p><i>7d. Tasks should enable students to explore creative solutions.</i></p> <p><i>7e. The process and products of the learning activity must be shared with others.</i></p>	<p><i>7b. Students should create something that has an impact in the real world. Something that has real value, not only for them, but possibly for others as well. The quality of the completed task should have a real consequence for the student that they value. Completing the task is not about getting a mark, but about creating something of value.</i></p> <p><i>7d. A purely technical approach to clinical practice is unlikely to lead to the development of clinical reasoning, critical thinking and problem solving (Schon, 1987). Practitioners may need to think "outside the box" in order to solve complex clinical problems that are "messy" and difficult to categorise. Design tasks that facilitate the development of products of learning that are creative and possibly even artistic.</i></p>
Immersive	

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
<p>8a. Are immersive, leading students to think as they would in the clinical context.</p> <p><i>8b. Allow the culture of the profession to be articulated and exposed.</i></p>	<p><i>8b. Immersion in the culture of the profession exposes physiotherapy students to the language, social norms and values of practitioners, thereby exposing what is often hidden from them (Higgs, 2004. This tacit knowledge is a significant aspect of “entering into the community”, enabling them to begin using the “tools” of the profession to engage as practitioners in it. Students make their own meaning through engaging with authentic activities within the culture of the profession.</i></p>
Literacy	
9a. Gradually introduce students to new learning environments.	9b. <i>Familiarity with technology as part of social practices does not translate into learning practices.</i>



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8. Chapter Eight: Determining features of the blended learning module

I've seen many schools that purport to emphasise communication skills, appropriate attitudes and health promotion in their curriculum. In looking inside these schools, however, it didn't take long to see that their business was actively teaching content in medicine, surgery and other disciplines – with the noble aims listed above receiving little direct attention

Dent & Harden (2005, p. 11)

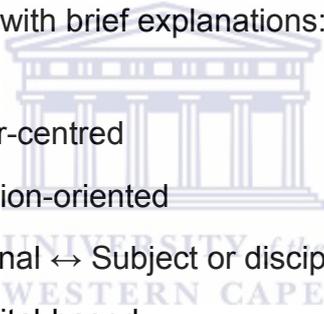
8.1. Introduction

Chapter Eight marks the end of the second phase of this design research project. This phase has included a narrative review of the literature that was used to identify key theories and concepts that formed the foundation of the draft design principles. Two pilot studies were then conducted, that aimed to explore the actual integration of technology into constructively aligned learning activities, and used those results to further refine the draft principles. This chapter presents the final aspect of this preliminary work to develop guidelines that can be used to design and implement a blended intervention in an undergraduate physiotherapy programme. From this point on, I occasionally make reference to “we”. This is in recognition of the collaborative nature of the research project as it moved into the final stages of development and design. Colleagues were often involved in discussions around the direction of curriculum changes, resulting in my use of “we” on occasion, simply to highlight that this was very much a collaborative process.

Since this blended learning module sought to develop, among other things, graduate attributes that went beyond knowledge and skills, I needed to learn more about how we want our new graduates to *be*, in addition to what we want them to know and be able to do. I needed to determine how we were going to create teaching and learning spaces that helped develop that *being*, and how we could integrate technology into this approach, in ways that placed the student at the centre of the process, rather than the content.

However, curriculum design is a multi-layered problem, with different skills required at different points in the process. It is beyond the scope of this project to discuss in detail the planning of curriculum reform, suffice to say that there are several different approaches to changing the curriculum, each with its own advantages and disadvantages. There are the needs of all the stakeholders to be considered, establishment of the learning outcomes, agreement and organisation of the content, deciding on an educational strategy and teaching methods, preparing assessment tasks and communication all the changes to relevant stakeholders (Dent & Harden, 2005).

Taking this into account, together with the understanding that there are many different approaches, we looked to the SPICES model for some insight into curriculum planning. This model places each aspect of the curriculum on a continuum that avoids a polarising view, and acknowledges that there are varying approaches to teaching (Harden, Sowden & Dunn, 1984). It allows curriculum planners to view the different aspects of the curriculum on a continuum, presented below with brief explanations:

- 
- Student-centred ↔ Teacher-centred
 - Problem-based ↔ Information-oriented
 - Integrated or interprofessional ↔ Subject or discipline-based
 - Community-based ↔ Hospital-based
 - Elective-drive ↔ Uniform
 - Systematic ↔ Opportunistic

Student-centred: What the students learn is emphasised over what is taught, and students are given more responsibility for their own learning.

Problem-based: Students learn by completing problems, in the form of tasks, which they might reasonably be expected to perform as a healthcare practitioner. The tasks are graded to be appropriate for the level of the student. Problem-based learning encourages students to move through a process that includes identifying the problem in the clinical case, determining their own lack of knowledge, asking appropriate questions, conducting research to find relevant information, and synthesising that information to develop answers to their questions.

Integration and interprofessional: The curriculum encourages students to view subjects

from the perspective of various other professions. In addition, subjects are not viewed in isolation, but as being related to each other.

Community-based: There is strong evidence for having students do more of their clinical work in the community, rather than solely in hospitals.

Electives: These can be thought of as a student-selected component of the curriculum, which serves to accommodate the self-identified needs of the student.

Systematic: There is a move towards the curriculum becoming more systematic, with fewer learning opportunities left to chance. Various recording methods identify gaps in students' opportunities for learning, which can then be addressed by curriculum planners.

Using the SPICES model created a context to begin thinking about the module changes with a few overarching curriculum components in mind. But, in addition to the overall educational strategy presented above, we would also need to make decisions about what to teach, how to teach, what to assess, how to assess, and how to manage this new module. We also needed to determine what we wanted our graduates to “look like”, in terms of the behaviours and attitudes that are expected of a healthcare professional in South Africa. We needed this description to go beyond the knowledge and skills that graduates are expected to “have”, and take into consideration how we want them to “be”. We wanted to design our blended learning module so that the “noble aims” of the curriculum were more than words on paper, and that the entire approach was constructively aligned in order to achieve the outcomes that were specified.

The aim of this chapter was to determine the characteristics of a blended learning module in the context of South African healthcare education, taking into account the following:

1. The desirable attributes of capable and competent healthcare professionals.
2. The teaching strategies used by clinical educators to develop those attributes.
3. The use of technology to enhance those teaching strategies.

The next section of this chapter identifies the professional attributes of capable healthcare practitioners, presents teaching strategies to develop those attributes, and ways of integrating technology to facilitate those teaching approaches. It also answers the question: What are the characteristics of a blended learning module that seeks to develop capability and competence in South African healthcare students?

The next section of this chapter is under review with BMC Medical Education as:
Rowe, M., Frantz, J., & Bozalek, V. Beyond knowledge and skills: The use of a Delphi study to develop a technology-mediated teaching strategy.

M.R. was responsible for substantial contributions to the conception and design of the project, the acquisition of data, and analysis and interpretation of the results.

J.F. and V.B. contributed to analysis and interpretation of results.

M.R. was responsible for drafting the article from conception to the final, submitted version.

J.F. and V.B. were responsible for the final approval of the version to be published, and for critical reading of the paper.



8.2. Developing a technology-mediated teaching strategy

Abstract

Background: While there is evidence to suggest that teaching practices in clinical education should include activities that more accurately reflect the real world, many educators base their teaching on transmission models that encourage the rote learning of knowledge and technical skills. Technology-mediated instruction may facilitate the development of professional attributes that go beyond “having” knowledge and skills, but there is limited evidence for how to integrate technology into these innovative teaching approaches.

Methods: This study used a modified Delphi method to help identify the professional attributes of capable practitioners, the approaches to teaching that may facilitate the development of these attributes, and finally, how technology could be integrated with those teaching strategies in order to develop capable practitioners. Open-ended questions were used to gather data from three different expert panels, and results were thematically analysed.

Results: Clinical educators should not view knowledge, skills and attitudes as a set of products of learning, but rather as a set of attributes that are developed during a learning process. Participants highlighted the importance of continuing personal and professional development that emphasised the role of values and emotional response to the clinical context. To develop these attributes, clinical educators should use teaching activities that are learner-centred, interactive, integrated, reflective and that promote engagement. When technology-mediated teaching activities are considered, they should promote the discussion of clinical encounters, facilitate the sharing of resources and experiences, encourage reflection on the learning process and be used to access content outside the classroom. In addition, educational outcomes must drive the integration of technology into teaching practice, rather than the features of the technology.

Conclusions: There is a need for a cultural change in clinical education, in which those involved with the professional education of healthcare professionals perceive teaching as more than the transmission of knowledge and technical skills. Process-oriented teaching practices that integrate technology as part of a carefully designed curriculum may have the potential to facilitate the development of capable healthcare graduates who are able to navigate the complexity of health systems and patient management in ways that go

beyond the application of knowledge and skills.

Keywords: knowledge and skills, blended learning, clinical education, professional attributes, teaching and learning, technology-mediated instruction



a) Introduction

Effective clinical practice requires that health professionals work within the dynamic, non-linear and complex environments of healthcare systems, and to engage with ill-structured problems that have no clear solutions (Bleakley, 2010). They need to “adapt to change, generate new knowledge, and continue to improve their performance” over time. These attributes (defined as *capability*) require more from the practitioner than a mere set of knowledge and technical skills. In order to effectively operate within the complex environments of healthcare settings, practitioners need abilities that include, but go beyond the knowledge and basic technical skills (defined as *competence*) that are emphasised in undergraduate education. This includes having positive attitudes towards continuing professional development, lifelong learning, evidence-based practice, information and knowledge management and interprofessional collaboration (Fraser & Greenhalgh, 2001).

In addition to discipline-specific knowledge, technical skills and generic attributes, healthcare practitioners are also moral agents who make decisions about patients based on personal connections and relationships with them. Values, beliefs and emotional factors are embedded within the interactions between healthcare providers and patients, suggesting that these interactions are more than the exchange of information. This active engagement with, and acknowledgement of, the emotional response to patients' stories can help to develop the moral agency that is a necessary part of ethical clinical practice (Delany, Edwards, Jensen & Skinner, 2010). Healthcare practitioners are also moral agents, with their own values and belief systems having an impact on how they practice. Ethical reasoning is therefore a significant aspect of clinical reasoning (Edwards, Braunackmayer & Jones, 2005).

However, developing these attributes and attitudes requires a cultural change in teaching practices that currently focus mainly on the development of knowledge and skills. Many clinical educators still adhere to a lecture and transmission-based approach to teaching (Kell & Jones, 2007), which is problematic if capability is the goal because it cannot be passively assimilated, and requires significant changes in clinical education that move it from being product- to process-oriented (Fraser & Greenhalgh, 2001). Teachers who adopt a transmission-based approach to teaching encourage the rote learning of facts, and a

resultant superficial understanding of the topic. In contrast, teaching approaches that focus on the process of conceptual change lead to deep learning (Kell & Jones, 2007), and include informal and unplanned, self-directed and non-linear learning experiences. Specific strategies include, among others, experiential learning, reflective exercises, feedback, peer-supported small groups, case-based and problem-based learning, and role play (Skultans, 1998).

Some clinical educators are beginning to experiment with technology-mediated teaching and learning practices, which blends classroom-based, face-to-face learning experiences with online interaction. This approach creates alternative means of communication between teachers and students, as well as deeper and more meaningful engagement with media-rich content. But, blended learning goes beyond the addition of technological components and requires rethinking and redesigning the teaching and learning relationship (Garrison & Kanuka, 2004; Gray & Tobin, 2010). If the integration of technology into the curriculum is to be effective, it must move beyond content transmission and aim to facilitate communication and reflection in teaching and learning practices that are interactive, flexible, collaborative and authentic (Ellaway & Masters, 2008). It should be emphasised that because of its highly contextual nature no two blended approaches are equivalent, which means that integrating technology into the curriculum requires thoughtful design.

There are limited studies on the development and implementation of blended learning strategies within clinical education (Gray & Tobin, 2010), with some authors asserting that the pedagogical evidence base for use of technology in the context of medical and health education is lacking (Boulos, Maramba & Wheeler, 2006). This presents a challenge. Technological components cannot simply be tacked on to traditional approaches without careful consideration (Wong, Greenhalgh & Pawson, 2010) but clinicians are usually not course designers, and neither of them are necessarily educational technologists. The different stakeholders may therefore lack the diverse skills necessary to effectively integrate technology into a blended curriculum that aims to develop the attributes required for effective clinical practice. Without a sound evidence base to work from, technology-mediated teaching in clinical education may be implemented without the necessary preparation and design. In order to prepare healthcare students for the dynamic and complex clinical environment, how can we ensure that technology-mediated teaching

facilitates the development of both competent and capable practitioners?

In order to address these challenges, this study used a modified Delphi approach to identify technology-mediated teaching strategies that aim to develop capability in undergraduate healthcare students. The study is significant in that it identifies attributes that go beyond knowledge and skills, as well as strategies that could be used to develop those attributes within a technology-mediated approach to teaching and learning.

b) Methods

Research design

The Delphi method is a research design that usually involves three rounds of surveys that are distributed to a panel of experts, with each round being informed by responses to the previous one. Delphi studies are used most often to gather data from domain experts with the intention of coming to consensus, often around poorly defined topics, such as developing programme alternatives (Delbecq, Van de Ven & Gustafson, 1975). There are no criteria upon which to determine the nature of the “expert”, the optimal panel size or even selection criteria of the panellists in a Delphi study (Hsu & Sandford, 2007).

The Delphi method has been used to determine the desirable attributes of physiotherapy students (Cross, 1999), to identify the key performance areas and assessment criteria for clinical performance among undergraduate physiotherapy students (Joseph, Hendricks & Frantz, 2011), and to determine competency in teaching practices (Wei, 2000). It was therefore felt that a Delphi study was appropriate for this study, as it has been demonstrated to be effective in similar areas. However, this study used a modified version of the traditional Delphi, in which a different panel of experts was consulted in each round, in order to gain insight into the different challenges with technology integration that have been highlighted.

The questions for the first round were based on a review of the relevant literature, with those for each subsequent round being derived from the previous responses. While a traditional Delphi study only uses open-ended questions in the first round, this study used them in each of the three rounds. Responses in a Delphi study are usually analysed statistically in order to strengthen the consensus that is reached. However, since reaching consensus was not the objective of the study, the statistical analyses for rating participant

responses were excluded, with responses from each round being analysed qualitatively (Delbecq, Van de Ven & Gustafson, 1975).

Panel participants

The panels for the study were purposively selected from within the researcher's personal and professional networks of practice, and included both South African and international experts. Table 8.1 below presents panel members' demographic information to support their selection.

Table 8.1: Participants' professions and experience in each round of the study

Demographic information	Round 1	Round 2	Round 3
Number of participants	25	21	13
Occupation*			
- Professor	7	3	2
- Lecturer	9	4	3
- Clinician	6	3	1
- Other	8	11	0
Profession			
- Physiotherapist	11	8	3
- Physician	7	3	3
- Surgeon	2	0	0
- Nurse	2	0	0
- Other	0	2	0
Years of experience			
- Range	2-36	4-25	15-25
- Average	19	14	21
Highest degree obtained			
- BSc	4	4	0
- MSc	12	3	3
- PhD	4	4	3
- M.Med	4	1	0
- Post Doctorate	1	0	0
Additional qualifications			
- Educational	13	4	6
- Clinical	11	11	3
- Management	1	0	0
- Other	0	1	1

** Note: Participants did not complete all sections of the questionnaires, hence the totals are inconsistent.*

The first round sought to answer the question: “What do we want our healthcare graduates to be, as opposed to what we want them to do?” The panel for this round included South African and international clinicians and clinical supervisors who were well-placed to participate in the study as a result of their experience in clinical practice. The aim of this first round was for clinicians and clinical supervisors to identify what they believed to be the attributes of a competent and capable healthcare professional.

The panel for the second round were guided by the question: “What teaching strategies would you use in order to develop the attributes identified in the first round?” The panel for this round included local and international clinical educators who were experienced in the education of healthcare students. They were informed of the attributes and attitudes that were identified in the first round of the study and asked to identify the teaching strategies they would use to develop them.

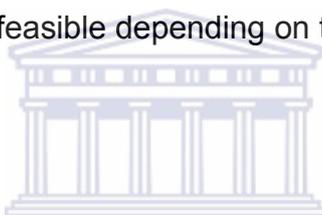
The third round of the study was guided by the question: “What are the ways in which Information and Communication Technologies (ICTs) can be integrated into the teaching strategies identified in round two?” The panel for this round included educational technologists and clinical educators with experience in integrating technology into teaching practice. This group were invited to participate in the study because of their experience in the use of ICTs in either their teaching, learning or clinical practice.

Procedure

The three rounds of surveys ran from October, 2011 to February, 2012. Questionnaires were sent to participants by email, or they were able to complete each round using an online, web-based survey. Emails were sent using the “Blind Carbon Copy” (BCC) feature of email, so that none of the recipients were able to see who the other panel members were. Reminders were sent out two weeks after the initial surveys were emailed. Round one was sent out in October and the results were analysed in November. These results led to the development of the second round survey, which was sent in December. The results of the second round were analysed early in January, and led to the development of the third survey, which was sent in late January. These final results were analysed in February, 2012.

Data analysis

The surveys consisted mainly of open-ended questions and responses were therefore analysed qualitatively. Participant responses were analysed thematically until saturation - the point at which no further themes were derived - was reached (Elo & Kyngäs, 2008). These emergent themes were then summarised and used to derive the questions for the next round of the study. Trustworthiness of the analysis was established using a framework for qualitative research that identifies the following criteria against which to judge the work; credibility, transferability and dependability (Hoepfl, 1997). The analysis, emergent themes and subsequent surveys were cross-checked by two other researchers who provided critical input on the results and analysis. In addition, the results are presented as quotes from the original text, and serve as supporting evidence for the themes that arose which, together with the critical review of two independent researchers, serves to establish both the credibility and dependability of the claims. The transferability of the claims is limited considering the specific context in which this study took place. However, transferability might be feasible depending on the similarity of other contexts to this one.



Ethical considerations

The study received ethical clearance from the University of the Western Cape Ethics Committee (project registration number: 09/8/16). All panellists received an information sheet for each round of the study and were asked to explicitly state their consent to participate. Panellists were not required to participate in this research project and non-participation had no negative effects on those who were invited. They could withdraw from the study at any stage, and have their responses removed from the database. All responses were anonymous. Panellists who chose to participate in the first round were under no obligation to participate in subsequent rounds.

c) Results

The major findings of the study are presented as responses to the overarching question that informed the round. The panel responses are presented as a narrative of the themes that arose during the analysis, and supporting quotes are provided.

Panellists in the first round were asked to identify what they thought capable students should “be”, as opposed to what they were expected “to do”. They strongly emphasised a

process of active engagement with people and concepts when it came to the characteristics of “being” a professional. They spoke of students needing to engage with and be willing to be part of a developmental *process*, in addition to “having” knowledge, skills, understanding and attitudes, which were seen as *products* or final outcomes of a competent student. They also emphasised the personal, affective components of students’ approaches to practice, taking into account the challenges that they often face, and giving voice to the complexity of the clinical context. Panellists identified the challenges of authentic engagement with ethical contexts in healthcare, again highlighting the complexity of the situations that students face and the emotional context in which healthcare is practised (note: content in italics are the author’s emphases).

“Being able to get the job done efficiently and safely even if it takes a bit longer in the beginning. A capable healthcare professional needs to know when to ask for help. They need *to be consciously knowing* of their areas of weakness or deficits. Capable also implies being able to connect with the patient on a human level.”

“The ability to build trusting relationship with patients and their family and with collaborators...Self accountability and evaluation of own standards of care...Ability to synthesize the evidence and to communicate it to patients and to their families in a fully open manner, subsequently considering to tailor the care in order to meet...their preferences or choices, beliefs, [and] options for self-management.”

“*love and care for people*, empathy. willingness to learn. wanting to make a positive contribution / empower. Resourcefulness. Kindness. Enthusiasm. Realising the importance of patient autonomy”

In addition to the emphasis on the process, participants also reported the importance of a wide range of the products of learning. These included students “having” knowledge (e.g. basic sciences, clinical sciences, and health policies), technical skills (e.g. procedural, communication and interpersonal skills) and “understanding” as having an important place in the curriculum. They also identified and emphasised that students should have the ability “to do” clinical reasoning and critical thinking. However, few participants went further

than to say that students should “have” knowledge, skills and understanding, or be able to “do” critical thinking.

Participants were asked about the role of professional ethics and ethical reasoning, as this is known to strongly influence personal and professional development that goes beyond “using” knowledge and skills. Respondents identified the challenges of authentic engagement with ethical contexts in healthcare, again highlighting the complexity of the situations that students face and the emotional context in which healthcare is practised.

“I think that there needs to be more than the mere outward observance of a standard professional ethical code...Emotions play a far greater role in decisions than we are inclined to admit. Emotional maturity, the internalisation of defined values and the *habitual, consistent practice* of those values is necessary to uphold those values in difficult times.”

“Ethics in health care starts with the recognition of the conditioning power of disease and of its effects on a human being. Therefore it requires responsibility, empathy with those in sufferance, respect to their autonomy, apprehension of the reality and a clear conviction of our possibilities and limits and above all, of our responsibilities towards the patient as health professionals.”

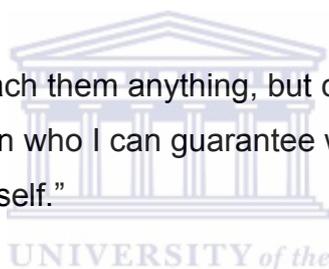
“Having *moral courage*”

In the second round, clinical educators were asked how they would go about facilitating a developmental learning process rather than focusing on the products of learning. Many panellists reported combinations of teaching strategies instead of only one approach. Teachers should provide a safe space for students to explore the domain independently, rather than telling students what they need to know. For this, appropriate role modeling is important, in which teachers demonstrate to students not only what to do and to know, but how to be. Using paper patients in small group sessions with guided discussion was a common suggestion, especially around the development of clinical reasoning and critical thinking. Educators should encourage the sharing of personal values and experiences among students and clinicians, as well as the impact of those experiences on themselves.

They should build reflective components into the curriculum, asking students how they deal with stress and emotion, and then how they feel about, and deal with, those responses. Students should be encouraged to provide evidence of engagement with their own emotional responses through reflective self-report, which should include a feedback component from peers and more experienced clinicians, who each provide alternative viewpoints. They should also be encouraged to develop agency and active engagement with each other, rather than being passive recipients of information.

“Encourage them to read widely and challenge themselves and others by always asking ‘why?’ By referring to development of staff in the department, my own professional and personal development. Informing students when I learn something new, when I learn from them, from patients, using articles, referring students to articles and reading these together in class.”

“I mention that I cannot teach them anything, but can only invite them to learn & that the only person who I can guarantee will learn from our (short) time together is myself.”



“Role modeling is the way that makes the biggest impact. As often as possible during routine clinical activities I make a point of referring to my own need for learning and development when addressing the students. I often look things up in a book on the ward round to illustrate the need for ongoing learning and the fact that even at a senior clinical level the needs for learning is ongoing.”

Participants in this round were asked to identify a range of teaching strategies that aimed to develop the attributes identified in the first round. It was noted that although “knowledge”, “skills” and “understanding” were highlighted by participants as being important, none of them went further than to say that students should “have” them. However, it is clear that knowledge, skills and understanding are important for any competent clinician, so the second round sought to identify how these aspects of professional practice (e.g. communication, technical skills, applying knowledge to practice, clinical reasoning, and critical thinking) could be developed. Participants' responses

covered a wide range of integrated teaching strategies that aimed to develop competence (i.e. knowledge and skills) among healthcare students. These included using lectures to cover key concepts prior to using practical demonstrations followed by observed practice and feedback. Participants suggested that teachers should make use of tutorials and modelling, either in the classroom or in the clinical context. Peer-teaching and peer-assessment emerged as one way in which students could take more responsibility for their learning. Role play that included “correct” and “incorrect” behaviour, followed by feedback from both teachers and peers was encouraged, particularly in the development of personal or affective attributes. Reflection in small groups, as well as by individuals, immediately after receiving feedback was advocated, although the details of how reflection could be incorporated into the programme was often lacking. The use of student-generated videos, followed by either peer- or teacher-evaluation and feedback was advocated. Using paper patients (i.e. case studies and problem-based learning) in small group sessions with guided discussion was a common suggestion, especially around the development of clinical reasoning and critical thinking. Many participants reported combinations of teaching strategies rather than suggesting only one approach. Quotes are presented below that demonstrate this integrated approach of using different teaching strategies.



“integrating short role play to teach communication skills (especially how to deal with emotional content of patient interaction), immediately followed by bedside interview, and then reflection individually and in a safe small group. Then this is followed by a compulsory formative assignment with a reflective component. Students comment that the role play leads into the authentic clinical consultation very well.”

“Teaching strategies would include; clinical demonstrations on models and patients as well as return demonstrations, working with students through the following steps; observer status, assistant status, active performer with assistance and finally active performer with minimal assistance but under supervision”

“Theory of the meaning of the practical technique of technical skill, and evidence for it. Demonstrate the technique and then let them practice

while I correct and explain again what the techniques aims to do. In revision THEY demonstrate a practical technique and the class critique”

Participants were asked how they could support students' values and emotional responses, seeing that the first round had emphasised the role that these characteristics can play in professional practice. The following themes emerged through the analysis of the participant responses. Educators should encourage the sharing of personal values and experiences among students and clinicians, as well as the impact of those experiences on themselves. They should build reflective components into the curriculum, asking students how they deal with stress and emotion, and then how they feel about, and deal with, those responses. Educators should acknowledge that students' emotional responses are valid, as long as they aren't to the detriment of their patients and colleagues. Students should be encouraged to provide evidence of engagement with their own emotional responses through reflective self-report, which should include a feedback component from peers and more experienced clinicians, who each provide alternative viewpoints. Students should also be encouraged to develop agency and active engagement with each other, rather than encouraging them to be passive recipients of information. Finally, educators should discourage the notion that “professionalism” is associated with being aloof and disconnected from the patient.



“Self-reflection that is structured, is written down and receives developmental feedback; positive role-modelling; students need to be given opportunities to develop their own sense of agency; if they are always passive in the health system as students then they will always be passive when professional.”

“The nature of the programme allows students to share personal values and experiences when discussing the cases. Principles of adult learning are used in facilitation of learning. The students have to develop trust to be able to share in their groups. This improves as they become more comfortable with one another.”

“Specifically asking students to express and discuss their personal values and emotional responses to patient encounters is a critical part of clinical

training. Students need to express what they think *and feel* in the clinical setting so that they learn to deal with value issues and emotional responses to events in clinical practice. Reflective diaries in which students reflect on their values and emotional responses are also used in our faculty. I think, however, that values and emotions need to be spoken about when they happen because that is the time of greatest learning and validation.”

In the third round, educational technologists and clinical educators were asked about the use of technology in teaching and learning contexts that supported continuing professional development, knowledge and skills acquisition, and emotional responses to clinical practice. Participants described a range of technology-mediated teaching practices that were interactive, integrative and reflective in nature, and which made use of technological features that enhanced student-centred and self-directed learning. In terms of using technology-mediated teaching practices to facilitate the development of lifelong learning and continuing professional development, participants reported that ICTs (Information and Communication Technology) offered a more flexible approach to learning. However, participants also suggested that underlying personal motivation and attitudes were more important than specific technological tools.

“[technology] can be exploited to encourage sharing, debate, questioning and thought provocation. Experts can role model the behaviours by posting links to recent research, plus corresponding questions to encourage further discovery and discussion.”

“The promotion of self-regulation is important in health-professionals education because it underpins the principles of PPD or lifelong learning, as well as non-technical skills development. ICT may be used to develop self-regulation skills as long as the technology is designed around the teaching and not the other way around.”

“Personal and professional development, i.e. lifelong learning is dependent on the personal attitudes and behaviour of an individual. No ICT per se has the ability to develop the attitudes and values which

underpin the principles of lifelong learning. Nevertheless, ICTs may help facilitate PPD as certain professional...organisations have shown.

[However], the role of ICT in PPD is secondary to the greater problem of self-assessment and self-regulation amongst healthcare professionals.”

In terms of using ICTs to develop knowledge and skills in the clinical context, participants suggested a range of strategies that promoted interaction, reflection and self-directed learning. In addition, participants advocated the use of ICTs to create more integrated learning experiences that went beyond merely learning facts. The following quotes are presented in support.

“Communities of practice are groups of people who share a concern or a passion for something do and learn how to do it better as they interact regularly. ICTs offer greater opportunities for people to create such communities and engage in a 'process of collective learning in a shared domain of human endeavour”

“Reflection can be personal or interpersonal activity, therefore ICTs which foster learning alone or with others may be suited for this purpose. Blogs or even forms of social media which require learners to analyse, evaluate or create knowledge may facilitate reflection-in-action or on-action...[Virtual patients] may allow learners to analyse, evaluate and create new knowledge, whereas learners may be limited as to how much knowledge they can reliably demonstrate using paper-based activities.”

“ICT can be used to promote engagement and interactivity. Audience response systems (ARS) come to mind as a method for facilitating this aim. The same may be true in the context of practical demonstrations. Learners can give feedback about performance during a practical demonstration.”

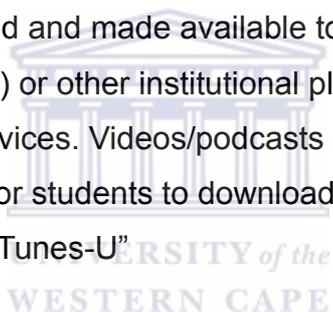
One of the main themes that emerged was the use of technology to displace content in time and place, moving it out of the classroom in order to create space for discussion and engagement. One common suggestion was for teachers and

students to make use of technology to record practical demonstrations and lectures, thereby shifting the content to be available anywhere, any time.

“Lectures can be provided as audio/video for the student to consume prior to meeting face-to-face (i.e. flipped classroom). The face-to-face component can then be devoted to rich learning experiences such as demonstrations, role plays and Q&A's.”

“ICTs should be considered the foundation stone of clinical study. Relevant tools and resources empower the students to direct their own learning, according to a predefined program or curriculum. Face-to-face sessions can then be focused on enriching and extending the learning experience and making it authentic.”

“Lectures could be recorded and made available to students via a virtual learning environment (VLE) or other institutional platform to view online or for download to student devices. Videos/podcasts of procedures of clinical skills could also be made for students to download and support just-in-time learning either via VLE or iTunes-U”



In terms of using technology to help support students' emotional responses to complex clinical situations, participants' suggested that it be used to create both synchronous and asynchronous supportive environments in which students could share difficult clinical encounters, and discuss those situations in a safe space. The sharing of experience should come from both teachers and students, as appropriate responses to ethical challenges could therefore be modelled to students.

“Creating a space where students can share their experiences and feelings without feeling threatened or judged: a simple example: the inbox message space of [social networks] allows students to share their experience with someone they trust and with whom they can be honest and open without feeling judged.”

“Supporting students' values and emotional responses may be facilitated

by ICTs, especially through the use of blogs or discussion forums.”

“drawings, poems, music to reflect moods and feelings with discussion on blogs and/forums to unpack the 'art work/drama”

While the use of technology to support the sharing and discussion of students' emotional responses to clinical situations was encouraged, several participants cautioned against the idea that technology is the best way to engage with students around sensitive topics. They suggested that working with students face-to-face at the moment of (or soon after) the clinical encounter is generally more appropriate.

“...this is one area where I think that personal contact with a senior doctor is essential. This is particularly true after traumatic incidents such as when the student participates in a resuscitation and the patient dies, or when they have a needle stick injury from an HIV+ patient”

“I think that f2f is definitely the safest way to get this kind of feedback. Usually ICT makes it harder for us to get cues that we normally use when giving or getting feedback. So with sensitive areas then we need to be especially careful.”

“I would prefer discussion to occur synchronously alongside or immediately after a learning encounter, however ICT may facilitate discussion to continue asynchronously after the learning activity is completed.”

Finally, while participants described the role of technology in teaching practices as being positive, they also suggested caution, in the sense that “the teaching should drive the technology, and not the other way around”. The following quotes are suggestive of a considered approach to the integration of technology into the curriculum.

“...the role of ICT is secondary to the environment in which the learning or reflection occurs.”

“Print, broadcast media, computers and diffused networks have introduced at least 4 new layers of mediation. It is often the affordances of these mediation layers that capture the attention of teachers and not their students pedagogical needs. When this happens, teaching suffers. When learning, however is foregrounded, and demands of pedagogy & subject matter come before bells and whistles, then technology can indeed enhance and enrich the teaching and learning process”

“ICTs can be extremely effective at bringing together learning from across a curriculum. This requires skilled instructional design, rather than technology per se.”

d) Discussion

This study highlighted several themes that are relevant for those interested in using blended learning as part of clinical education. These are summarised as follows: personal and professional development must go beyond “having” knowledge and skills, and should incorporate students' emotional responses and personal values; clinical educators who aim to develop these attributes should consider teaching practices that are interactive, integrated, reflective and formative; technology-mediated teaching and learning can facilitate the development of attributes that have an impact on professional practice; and integrating technology into teaching practice goes beyond simply choosing what tools to add to the curriculum. The following discussion will explore each round of the study in turn, incorporating the results of this study with the literature.

The first round of the study sought to identify the attributes of a healthcare practitioner that went beyond simply having knowledge or a set of technical skills. These attributes were described by participants in terms of a *state of being*, in addition to “having” a set of facts and skills. Participants emphasised the process-oriented nature of professional development, rather than the products (i.e. what students should “know” or be able “to do”) that are commonly used to frame healthcare curricula outcomes. This process-centred notion acknowledges that knowledge should not be perceived as a static, linear set of facts. Instead, by considering it as dynamic, non-linear and multidimensional, we can help students prepare for the complexity of clinical practice by making use of teaching practices that facilitate the development of capability (Fraser & Greenhalgh, 2001). While it emerged

that clinical education must move beyond superficial notions of “having” knowledge and skills, it must be noted that participants did not ignore the *competency*-aspect of clinical education. They still placed a high value on the knowledge and technical skills that students must have, highlighting, in aggregate, similar attributes to those found in the literature (Cross, 1999; Joseph, Hendricks & Frantz, 2011).

In the second round of the study, clinical educators advocated a combination of different approaches that sought to develop more complex outcomes than merely the ability to perform a procedure, or know a fact. The developmental nature of the process was emphasised, highlighting the importance of feedback and formative assessment as part of the process, rather than a separate function. These integrated teaching and learning practices emphasised the connection and interaction between people in a process that values human relationships (Doll, 1992) and strives to create a safe space in which to explore new knowledge. Contrast this approach with that of “pimping” in medical education, where fear is often used as a motivating factor in the culture of the profession (Jarvis-Selinger, Pratt, & Regehr, 2012). It seems then that many of the teaching strategies suggested in this study are a response by some educators to reach for “newer, more interactive, authentic, integrative and transformative approaches to learning and teaching” (Mennin, 2010, 21). The results from this study provide evidence that the instructivist paradigm of “transmitting” knowledge from teacher to learner must give way to constructivist models that facilitate the social nature of teaching and learning.

While it was tempting to classify the teaching strategies suggested broadly as, for example, either transmissive (e.g. lectures, watching video demonstrations) or interactive (e.g. working in small groups, peer teaching) categories, it soon emerged that few teaching strategies were recommended in isolation. Instead, clinical educators advocated a combination of different approaches that sought to develop more complex outcomes than merely the ability to perform a procedure, or know a fact. The developmental nature of the process was emphasised, highlighting the importance of feedback and formative assessment as part of the process, rather than a separate function. These diverse and integrated teaching strategies mirror, to some extent, the process-orientated methods advocated by Skultans (1998) i.e. they should be informal (e.g. reflective exercises), self-directed (e.g. peer-supported learning groups) and non-linear (e.g. role play, small groups, and case-based learning).

In terms of specific approaches to developing knowledge and technical skills, participants included interactive lectures as part of an integrated approach that included practical demonstrations of procedures and techniques, supplemented with role play and regular, immediate feedback. These integrated teaching and learning experiences emphasised the connection and interaction between people i.e. it is a process that “values human relationships” (Doll, 1993). This stands in stark contrast to a knowledge-transmission form of teaching, which is poorly suited to developing the attributes necessary for capable therapists, and which many clinical teachers still subscribe to (Gray & Tobin, 2010). In contrast, it seems that many of the teaching strategies suggested in this study seem to be a response to “...the urge to reach forward to newer, more interactive, authentic, integrative and transformative approaches to learning and teaching” (Mennin, 2010) that the clinical education community are grappling with. There is evidence to suggest that the instructivist paradigm of “transmitting” knowledge from teacher to learner must give way to constructivist models that facilitate the social nature of teaching and learning (Fraser & Greenhalgh, 2001).



Participants highlighted the fact that teaching practices seeking to support students' values and facilitate their emotional development in the context of ethical practice, should focus primarily on creating safe spaces in which personal, emotional expression is valued and not judged. In addition, reflection, discussion and feedback must be incorporated into the curriculum in structured ways, rather than simply giving students the responsibility to reflect on their own. Reflection must be related to the clinical context and should encourage students to identify and comment on their own (and their peers') emotional responses. This sharing and discussion of clinical experiences is essential for professional development, and the link must be made explicitly if students are to engage in the process (Welch & Dawson, 2006). Feedback is especially important, as there is evidence to suggest that it does have a role in the shaping of students' values (Epstein, 2007).

In the third round of the study, panellists explored the role of ICT as part of teaching strategies to develop the characteristics highlighted in the first round. Constructivist approaches to teaching and learning have been demonstrated to be enhanced through the use of ICTs, particularly when thoughtfully implemented (Garrison & Kanuka, 2004). Participants in this study acknowledged the potential role of ICTs in the development of

knowledge and skills, particularly if they had features that facilitated behaviour that was interactive, integrated, reflective and which allowed feedback. In addition, ICTs allow for the displacement of content away from the classroom context, freeing up time for interactive engagement with other students and the teacher. When combined with the possibility for enhancing content with rich media, ICTs were acknowledged to have a potentially powerful role to play in the development of attributes relevant for clinical practice. However, participants also discouraged the use of ICTs for its own sake, suggesting that a sound pedagogical teaching strategy must drive and support the implementation of technology in teaching practice, echoing the suggestions of other studies in this domain (Boulos, Maramba & Wheeler, 2006). In addition, technology in teaching needs to be easy to use, and must be perceived by students to have value, if they are to engage with it (Wong, Greenhalgh & Pawson, 2010). For technology-mediated teaching to be effective, it must facilitate communication and reflection in teaching and learning practices that are interactive, flexible and collaborative (Ellaway & Masters, 2008).

The personal values and emotional context of healthcare identified as integral aspects of professional and ethical practice in the literature, were strongly emphasised by participants, who were clear in their suggestion that ethical behaviour is more than an act of *doing*, or *knowing*. Participants highlighted that ethical behaviour is a state of *being*, and that the development of ethical behaviour among students must acknowledge the deeply personal, emotion- and value-laden context of individuals. The attention to personal values is highly significant when considering a relationship-centred approach to healthcare, in which the importance of interactions or “connectedness” between people, social, political, economic and environmental factors are emphasised (Kyler, 2005). Participants' in this study called for students to “internalise” and “habitually practice” values, rather than merely know about them, and highlighted the idea that “knowing about” is very different to “being”. This sentiment is especially important for clinical educators to be aware of when teaching. The acknowledgement of, and reflection on, emotional responses to patients' situations can facilitate an increased awareness of the ethical dimensions of practice that decrease the gaps between ethical *knowledge* and ethical *practice* (Delaney, Edwards, Jensen & Skinner, 2010).

Technology can be used in the creation of online, collaborative spaces that encourage sharing and discussion of clinical encounters and ethical dilemmas. In addition, blended

learning approaches have been demonstrated to encourage “flexibility, reflection, interpersonal and teamwork skill development, motivation, and collaborative learning environments— resulting in deep and meaningful understandings” (Garrison & Kanuka, 2004). However, participants also suggested that the use of ICTs in sharing and discussion of ethical challenges may be best supported with face-to-face reflection and feedback immediately after the clinical encounter. However, ICTs may provide an alternative where face-to-face contact is not possible e.g. students working alone in remote areas.

e) Conclusions

It is clear that there are changing conceptions of the knowledge, skills and attitudes required for professional practice, which shift the focus from the products of learning to the process of learning. As clinical educators, we must move beyond describing our students in terms of things they should know and be able to do, and should develop teaching strategies that facilitate a state of professional “being”. We should use teaching practices that integrate knowledge from different curricular domains, that are interactive rather than transmissive, and should accommodate guided, reflective activities that include feedback as part of the curriculum. Technology-mediated teaching does have the potential to change the teaching and learning practices that aim to develop healthcare students who are better equipped to deal with the complexity of clinical practice. However, if we choose to integrate technology into teaching practices that are guided by these principles, then our choices of technological tools should reflect considered outcomes that are framed in the context of what we want our students to be, rather than what we want them to know and to do. Finally, the specific technologies we choose to integrate are less important than the teaching and learning environments we create.

f) Limitations and bias

The study has certain limitations and inherent selection bias, including the fact that panel participants were selected by the researcher. Unlike a traditional Delphi study, there was only a limited opportunity for participants to review their responses in summary. However, since there was no aim of determining consensus, this is unlikely to have affected the outcome of the study. Finally, these results and conclusions are most likely highly context-dependent, because of the nature of qualitative research, blended learning, and selection bias.

8.3. Conclusion

Chapter Eight identified ways in which technology could be integrated into teaching strategies that would facilitate the development of attributes or characteristics that are important for capable healthcare professionals.

The first round of the study concluded that students should actively engage with people and concepts, rather than taking a passive approach to learning. Professional development should be thought of as helping students through a learning process, in addition to acquiring knowledge and skills. There was an emphasis on the impact that personal affect and values have on professional practice, and that these are difficult to develop in a course that emphasises “having” knowledge and skills. There was a suggestion that we need to centre our teaching on relationships instead of around content, and as such we would need to rethink and redesign our own conceptions of teaching and learning.

The second round of the study stressed that because the clinical context is dynamic, we must create a culture of ongoing research and lifelong learning in order to stay up-to-date with relevant practice and emerging research. The value of self-evaluation was highlighted as an important component of professional development, and was associated with reflection on one's own learning, which must be an integral part of the curriculum. Role modeling was highlighted as essential in demonstrating to students good examples, not only of clinical practice, but of *ways of being* a healthcare professional. It creates a space in which students are encouraged to think about the relationship between actions and objectives that are mediated by human relations, which develops an understanding of the world based in experience (Laurillard, 2012). In order to develop both competency and capability, the panel suggested that integrated teaching strategies be used to introduce a variety of teaching approaches and opportunities for learning.

The third round of the study presented strategies to integrate technology into teaching practices that might develop capable healthcare practitioners. The panel proposed a range of ICT-enabled teaching and learning practices that are interactive, integrated and reflective. It was suggested that ICTs be used to offer flexible learning experiences that went beyond the learning of facts, and emphasised the development of ways of being. In

addition, technology could be used to displace content and activity in time and space, freeing up time in the classroom for interactivity and discussion, rather than for delivering information. Finally, panellists urged caution when considering the use of technology, highlighting that the “teaching should drive the process” and not the other way around.

The results of this aspect of the project had a deep impact on how I thought about teaching and learning relationships at the time. I wrote the following reflection on my blog at around about the time that I was planning the Delphi study.²⁷

When I started teaching in the department about 3 years ago, I decided that I wouldn't accept friend requests on Facebook from any of our students, nor would I send them any. I had a few reasons for this, including the following:

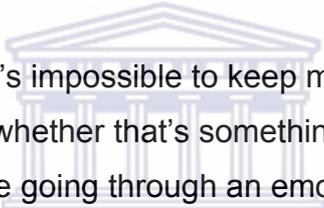
- It'd be an invasion of their privacy
- They may feel an obligation to accept, even if they didn't want to
- I didn't feel comfortable hearing and seeing what they were doing in their private lives
- I wasn't sure that I'd be able to remain objective if I grew closer to the students I shared interests with
- I was trying to keep my professional and private lives separate

Last year I ran a social networking research project in our department, which had students completing assignments within a private social network that I set up using WordPress and Buddypress. I learned a lot through the experience, including the following:

- Facilitating engagement around professional issues in a social environment is hard
- Students use (or don't use) the tools in the way you expect / want them to
- Most of them only participated in the network for the duration of the assignment, and didn't go back when it was completed
- Students shared personal experiences (with me and with each other) in ways that helped me to see more clearly who they really are

²⁷ The full text of the post is available at <http://www.mrowe.co.za/blog/2011/01/facebook-friends-and-students/>

The last point was perhaps the lesson that touched me most. Most of our students have a tendency to see us as “just lecturers” and feel that there’s a huge chasm between us and them. To get around this, I often share some of my personal experiences to show that I also struggle to get through the challenges I’m presented with. I try to highlight the fact that as they find some things difficult to overcome, so do I and that the only real differentiator between us is our levels of experience in the various domains of our lives. This has happened most often with students on one of the rural community placements that I supervise. I often spend hours talking to them about some of the issues they’re experiencing, not only on the placement, but also in their personal lives. This has had a profound impact on some of them, as they’ve come to me after graduating and told me how much those social interactions helped shape who they’ve become.



I’m beginning to think that it’s impossible to keep my personal life out of the classroom and in addition, whether that’s something I should even strive for. The end of last year saw me going through an emotional upheaval that was devastating. I was incapable of thinking clearly, let alone teach (thankfully, classes were over for the year) and it was clear that my personal experiences very much affected my professional behaviour. This got me thinking about what our students bring with them into the classroom that we have no idea of, and which has a profound impact on how they’re able to participate in the class. What I’ve learned through this is that my social and professional personas are not only connected, but deeply integrated and to ignore that is to miss out on really understanding myself and my students.

I think that the emergence of the *emotional* components of the second round of the Delphi study, together with the study I had conducted using the social network in the department, combined with my own personal experiences, really pushed me to reconsider what teaching and learning is. I found the notion of “telling students” deeply unsatisfying and this is when I really knew that there must be more to teaching than telling. It was at about this point that I really began thinking about what it means to connect with students as part of a process around teaching and learning.

The conclusion of this chapter marks the end of the second phase of the design research process, that looked at the development of solutions that are informed by existing design principles and technological innovations. At this stage of the process, the first full set of draft design principles have been produced, and the solutions to the problem have been planned. See below for a review of the second phase:

1. Draft design principles were derived from a narrative review of the literature. The aim of this review was to find relevant theoretical principles and frameworks to guide thinking around the process, as well as to find existing design principles that may have addressed similar problems. Design principles from other fields were explored in order to find approaches to technology-integrated teaching and learning practices that could be used to inform the implementation of the intervention. This review was presented in Chapter Five.

2. Consider how best to operationalise the intervention in an e-learning environment, using appropriate technologies. I conducted two pilot studies using appropriate technology, as well as soliciting input from other stakeholders in the form of a Delphi study. The pilot studies were an opportunity for me to put into practice some of what I had learned about teaching with technology. I was able to experience first hand the theories and ideas that had emerged during the initial phase of the study and had demonstrated in a very real way that learning about teaching with technology is different from actually doing it. These smaller studies were described in Chapters Six, Seven and Eight, and included modifications made to the draft design principles after evaluating the outcomes of each study.

3. Design the learning environment. Chapter Nine will describe how the final set of draft design principles (see Table 8.2 below) were used to create and implement the blended approach.

Table 8.2: Draft design principles following the outcomes of the study presented in Chapter Eight.

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
Interaction	
<p>1a. Encourage both synchronous and asynchronous communication between people.</p> <p>1b. <i>Formative assessment in the shape of peer review and feedback is an ongoing part of the activity.</i></p> <p>1c. Incorporate face-to-face contact.</p> <p>1d. <i>Interaction can happen between people and content.</i></p> <p>1e. <i>Make space for interactions outside the classroom.</i></p> <p>1f. <i>Lecturers should be role models</i></p> <p>1g. <i>Lecturers must be prepared to model “not knowing”</i></p> <p>1h. <i>Move content out of the classroom.</i></p>	<p>1b. <i>Peer review and feedback should be integrated into the activity, rather than something separate, and it should occur throughout the process. Formative assessment (i.e. assessment that aims to improve learning) should not be separated from the activity, but integrated into it.</i></p> <p>1d. <i>Content can be interactive physically, in the sense that digital content can be responsive to students, and their actions. Rich media can include interactive images, video, and dynamic content that is different for each student. It can also be interactive cognitively, in the sense that it can cause people to take action, rethink behaviours, stimulate discussion (think, commenting on a shared video of student performance), etc.</i></p> <p>1e. <i>The “learning environment” should be thought of as all of the possible physical and online spaces where learning happens, rather than just the classroom.</i></p> <p>1f. <i>Role modelling, is essential, not only presenting to students what they should know and do, but how to be. “Role modelling” is not an isolated, separate process or activity, but an integrated aspect of the learning process.</i></p> <p>1g. <i>When lecturers demonstrate to students that they don't know the answer, they create a safe space for students to “not know the answer”. By removing the requirement to always be right, students</i></p>

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
	<p><i>are more likely to articulate their understanding. By always being correct, lecturers create high expectations in students who think that this is what they should be aiming for. But students, who are novice practitioners and novice learners, struggle to understand that it is impossible to know everything. Indeed, “knowing all the answers” negates the need to continue learning. By emphasising learning in the programme as an iterative process of development, rather than a means to an end, students become “future-proof”, able to adapt and respond to any situation in which they don't know the answer or when the answer is ambiguous.</i></p> <p><i>1h. when content is displaced in time and space (i.e. it can be engaged with at any time, in any place), it can be moved out of the classroom to make room for discussion and engagement through richer, more diverse learning experiences e.g. discussion, questioning, role modelling, practical demonstrations.</i></p>
Articulation	
<p>2a. Require the articulation of understanding.</p> <p>2b. The articulation must be supported with evidence, and stated as an argument.</p> <p>2c. The articulation should be presented in a public space, to enable them to be challenged (or praised, or validated).</p> <p>2d. Challenges to students thinking processes should be in the form of a question.</p>	<p><i>2b. By teaching students to construct arguments (which represent understanding, upon which actions are based) informed by evidence, they are empowered to think and act in the world because their understanding is validated. This development of agency “permits” students to control the direction of their learning.</i></p> <p><i>2c. “Public”, in this context, can mean visible to the world, or visible to others in the class, or just others in the group.</i></p>

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
2e. Articulation should be based on personal experiences.	
Complex	
3a. Embrace complexity as an integral component of clinical learning.	<i>3a. Patients' problems are multi-factorial, with many interdependent variables that defy simplistic definition and categorisation.</i>
3b. Activities should have poorly-defined boundaries that do not lend themselves to simple solutions.	<i>Encouraging students to engage with complexity and deal with uncertainty at an early stage of their education may help in later stages.</i>
3c. Activities should be difficult to solve working as individuals.	
Reflective	
4a. Reflection is an integral part of the task.	<i>4c. Activities should require reflection on an individual level, but also reflection within groups. The sharing of personal reflections with others normalises what students are experiencing, as well as presents different ways of being.</i>
4b. Lecturers must model reflection in- and on-action.	
<i>4c. Reflections should be individual and shared experiences.</i>	
<i>4d. Feedback on reflection should be included as near to the original experience as possible.</i>	<i>4d. When students reflect on their performances, lecturers must give feedback on the reflection as near to the experience as possible. Activities must therefore have reflection, and feedback on reflection, built in.</i>
Acknowledge emotion	
<i>5a. Emphasise the personal, affective aspect of learning.</i>	<i>5a. Learning is deeply personal, and students should have an emotional attachment to what they learn about. If they care about their learning, they are more likely to be motivated to be better at it.</i>
<i>5b. Activities should require students to confront their emotional</i>	

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
<p><i>responses to complex clinical situations.</i></p> <p><i>5c. The learning environment should support and validate students' emotional response.</i></p> <p><i>5d. Students should be encouraged to share personal values and experiences.</i></p> <p><i>5e. Lecturers should share their own emotions, and their emotional responses, to students.</i></p> <p><i>5f. Face-to-face contact may be necessary to discuss sensitive topics.</i></p>	<p><i>5b. Students will be confronted with many situations in the healthcare context, that will create uncomfortable emotions (e.g. shame, fear, sadness, regret, humiliation). By developing the skills necessary to deal with these emotions, they can be better prepared for the reality of the clinical context.</i></p> <p><i>5c. The learning environment should be a safe space for students to share deeply personal experiences and thoughts, as well as help them to deal with how they feel about their emotional response. Students' emotional responses should be validated and confirmed, giving them the confidence to explore those responses further.</i></p> <p><i>5d. By sharing personal values and experiences, students bring themselves into the learning process. Teaching moments can be created around the shared experiences of students, creating stronger impact by “bonding” the learning that happens to a personal experience.</i></p> <p><i>5e. Lecturers can model their own emotional response by sharing how they feel about certain things, or how they dealt with similar problems. This not only scaffolds a process of metacognition to students, but normalises the sharing of emotion.</i></p> <p><i>5f. It may be necessary to fully explore sensitive topics in the classroom, as there are many aspects of communication that are relevant but which cannot be expressed fully in digital spaces (e.g. facial expression, body language, tone of voice).</i></p>

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
Flexible	
<p>6a. The learning environments (physical and online) should be flexible, but also include structure.</p> <p>6b. Flexible content.</p> <p>6c. Flexible <i>teaching and learning strategies</i>.</p> <p>6d. Flexible curriculum.</p>	<p><i>6c. Teachers should make use of multiple teaching strategies, while students should be encouraged to make use of multiple learning strategies. No single approach to teaching or learning can possibly lead to the variety of outcomes that a capable and competent practitioner needs for successful practice.</i></p> <p><i>6d. Allow students to explore the curriculum independently, rather than telling them what they need to know. If they begin in a direction that was “supposed” to be covered later in the year / programme, modify the programme if possible.</i></p>
Relationship-centred	
<p>7a. Aim to mediate learning relationships through interaction between people, content and objects.</p> <p>7b. Encourage collaborative rather than isolated activity.</p> <p>7c. Responsibility for learning must be shared with others.</p> <p>7d. Facilitators are active participants in completing the activity.</p> <p>7e. Emphasise that students are valued <i>partners</i> in the process of teaching and learning.</p> <p><i>7f. Encourage a sense of “being”, rather than “knowing how to be”</i></p>	<p><i>7e. Teaching and learning are not separate entities, and the online and physical spaces must allow for complex relationships to exist in a dynamic state where teaching and learning are integrated.</i></p> <p><i>7f. Create learning spaces in which “being” is valued as much as, or even more than, “knowing”. A process-centred notion of the curriculum acknowledges that knowledge is not a static, linear set of facts, and that knowledge can be sought out (or personally created) when it is necessary.</i></p>

Draft design principles	Rationale behind the principle
Integrating technology into clinical education may best be facilitated by learning designs which:	
Creative	
<p>8a. Include <i>activities that enable knowledge management</i>.</p> <p>8b. Require students to create some of their own learning materials.</p> <p>8c. Students should work on tasks that are iterative.</p> <p>8d. Tasks should enable students to explore creative solutions, <i>that are allowed to fail</i>.</p> <p>8e. The process and products of the learning activity must be shared with others.</p>	<p><i>8a. Activities should require students to analyse, evaluate and synthesise information, as a process of personal knowledge construction.</i></p> <p><i>8d. Being allowed to fail encourages students to take a chance, to risk “not being right”. By allowing failure (or misunderstanding), lecturers create a space in which students are prepared to share their understanding, knowing that misunderstanding (in the early stages) is part of the learning process. By being allowed to fail, they are more likely to articulate what they know.</i></p>
	
Immersive	
<p>9a. Are immersive, leading students to think as they would in the clinical context.</p> <p>9b. Allow the culture of the profession to be articulated and exposed.</p>	
Literacy	
10. Gradually introduce students to new learning environments.	

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9. Chapter Nine: Creating and implementing the blended learning module

What is learned should be subordinated to how it is learned...Control and power have to be shared more and centralised less

Ovens, Wells, Wallis & Hawkins (2011).

9.1. Introduction

Chapter Nine marks the beginning of the third phase of the design research process. At the end of Chapter Eight, I presented the final set of draft design principles for the development of capability in undergraduate physiotherapy students. These design principles are presented below, summarising the contributions of each study up to this point, providing a rationale for the principle. The chapter then describes how those principles were used to create and implement the intervention. The aim of this chapter is to design a blended learning module, using appropriate theoretical frameworks, relevant technology, and input from the preliminary studies.

9.2. Designing the blended learning module

This section presents the final set of draft principles that were derived from the studies conducted and presented in earlier chapters, including the rationale behind each of the design principle choices. These are the design principles that we used to develop and implement the blended learning module that aimed to develop a range of attributes that included an attitude towards lifelong learning, critical thinking, clinical reasoning and problem solving in the clinical context. These attributes were considered to be important in the development of capable physiotherapy practitioners.

a) Final set of the draft design principles

Table 9.1 below presents the final set of draft design principles, derived from studies conducted during this research project that were presented from Chapter Five to Eight, that aimed to address the problems highlighted in Chapter One. In the table, the design principles are presented along with extended descriptions. The description of the principle is derived from the major themes that emerged from the studies conducted in this project, as well as having been informed by their associated literature reviews. The principles have also been re-ordered, taking into the account the ease with which it could be implemented.

Table 9.1: First complete set of draft design principles following the outcomes of the second phase of the design research process.

<p>Developing capability in physiotherapy students may best be facilitated by learning designs which:</p>
<p><i>Design principle 1</i> Facilitate interaction between people and content</p> <p>Interaction between people is based on communication that is used to create learning environments that support the social construction of knowledge. This communication is about more than simply sharing information, since technology can be used to create new and powerful forms of enhanced communication. It includes peer review and feedback as part of an iterative, continuous process of formative assessment that aims to improve understanding through dialogue. Feedback should be framed as an input into the learning process, rather than a criticism of incorrect understanding.</p> <p>Interaction can take place in physical and online spaces, using content as a framework for discussion. Content need not be inert and “passively received” since digital content can also be interactive, responding to students in ways that lead to further reflection and action. Cognitive interaction with content means that the content can respond to students in ways that can cause them to take action, reflect further or stimulate discussion (e.g. clicking on links and other digital objects can cause the content to change). If content is moved out of the classroom, teachers can use contact time for meaningful engagement with students. The “learning environment” then becomes all of the possible physical and online spaces where learning happens.</p>
<p><i>Design principle 2</i> Require the articulation of understanding</p> <p>By articulating the thinking and reasoning behind their understanding and behaviour, students are giving their abstract ideas form and structure. Students and lecturers should articulate their understanding of concepts and personal experiences, by committing to a statement that is supported by evidence. Using personal experiences creates opportunities for learning that lead back to changes in students' thinking and behaviour. Without using personal experience, the process is disembodied and separate from the student, having little relevance or consequence for them.</p> <p>This articulation of understanding should be public, making them accountable for the thoughts and actions they articulate as they engage in the world. In this context, “public” can mean visible to the group, visible to the class, or visible to the world. By making public statements of understanding, students' thinking can be challenged or reinforced. This allows lecturers to correct a misconception or build on correct understanding. Reinforcing thinking patterns validates the pattern and creates a more stable foundation upon which to build new understanding. Challenges should be in the form of questions that aim to expose logical inconsistency and to stimulate further thinking, rather than to elicit information. “Not understanding” something is not a point of failure, but an opportunity to reflect, question, and re-articulate. By viewing unwanted behaviour as the articulation of</p>

misunderstanding, lecturers can correct the misunderstanding in order to change behaviour.

Design principle 3

Builds relationships

If knowledge can exist in the spaces between people, objects and devices, then it exists in the relationships between them. Aim to mediate learning relationships through interaction between people, content and objects. Encourage collaborative, rather than isolated activity, where the responsibility for learning is shared with others in order to build trust. Facilitators must be active participants in completing the activities, while emphasising that students are partners in the process of teaching and learning. Completing the learning activity together exposes students to the tacit, hidden knowledge of the profession. In this way, lecturers are not authority figures who are external to the process of learning. Rather than being perceived as *gatekeepers* who determine progression through the degree by controlling students' access to knowledge, lecturers can be seen as *locksmiths*, teaching students how to make their own keys as they need them.

While interacting with students, lecturers should model ways of thinking, doing and being, as well as normalising “not knowing the answer”. By removing the pressure to always have the correct answer, lecturers create a safe space for students to articulate their incomplete understanding. A sense of “knowing all the answers” negates the need to continue learning. By emphasising that learning is an iterative process of development, students become “future-proof”, able to adapt and respond to any situation in which they don't know the answer, or when the answer is ambiguous. Being allowed to fail encourages students to take a chance, to risk “not being right”. By allowing (and even encouraging) failure, which is a representation of misunderstanding, the lecturer creates a space in which students can safely share their understanding, knowing that partial or incomplete understanding is part of the process of learning.

Encourage students to develop sense of “being”, rather than “knowing how to be”, where the process of learning is more important than the products. A process-centred view of the curriculum acknowledges that knowledge is not a static, linear set of facts, and that it can be sought out (or personally created) when it is needed. Teaching and learning is seen as a symbiotic relationship, with each party dependent on the other. Students are then not seen as passive recipients of knowledge, and lecturers are not content-delivery mechanisms. Teaching and learning becomes a dynamic relationship between people.

Design principle 4

Embrace complexity

The clinical context is complex, where patients' (and health systems') problems are defined in terms of complex interactions between multiple, interdependent and dynamic variables, that defies simplistic categorisation. By developing learning spaces that are more complex, rather than simplified versions of reality, we can help students negotiate uncertainty in the later stages of their education and careers. As students encounter increasingly complex tasks, they must adapt to the evolving situation, taking new

variables into account.

Activities and tasks within the learning space should have poorly-defined boundaries that do not lend themselves to simple solutions, and are not contained within simple subject boundaries. These learning activities and tasks should be difficult to complete while working as individuals e.g. Different members of the healthcare team bring different skills to patient management, all of which are essential aspects of total care (think phlebotomists and blood work, X-rays, porters, etc.). They should also not be isolated from the real world context i.e. they should reflect the complexity of reality.

Design principle 5

Encourages creativity

Complexity means not being able to predict or plan for all possible outcomes, so being able to adapt to complex situations means needing to create paths to knowledge when it is needed. Include activities that enable knowledge management by requiring students to create some of their own learning materials. This ensures that the process and products of learning are personally meaningful, as it serves to fill a gap in students' self-identified knowledge and understanding. In this way, the content around which interactions take place is not generic, but personal, and therefore has an inherent value that is not dependent on marks. Practitioners must often solve “messy” problems that are difficult to categorise. Learning activities should therefore facilitate the development of solutions that are creative, and possibly even artistic.

These materials should be created by completing tasks that are iterative and that enable students to explore creative solutions. Creating learning materials develops skills in knowledge management, as students must find, aggregate, filter, summarise and synthesis information to extract what is relevant for their needs. When peer review and feedback (i.e. interaction through communication) are included as part of the process, new gaps in understanding are exposed, new ideas surfaced and the process iterates. The process and products of the learning activity must be shared with others, and in this way, bring about change in the real world by influencing the thinking and behaviour of others.

Design principle 6

Stimulate reflection

Reflection should be seen as an integral part of the task, not a separate, isolated activity that has no consequence for the student. Lecturers should model reflection in- and on-action, providing scaffolding for students to structure their own reflections. Reflections should be individual and shared experiences. Sharing personal reflections with others serves to normalise the situations that students encounter, as well as their emotional response to those experiences. In addition, sharing with each other presents different ways of thinking, doing and being. Feedback on reflection should be provided as soon after the original experience as possible. Activities must therefore have reflection, and feedback on reflection, built in.

Design principle 7

Acknowledge emotion

Since learning is ultimately a deeply personal activity, the affective aspects of learning should be emphasised. The learning environment should be a safe space for students to share deeply personal experiences and thoughts, as well as help them to deal with how they feel about their emotional response. Students' emotional responses should be validated and confirmed, giving them the confidence to explore those responses further. By sharing personal values and experiences, students bring themselves into the learning process. Teaching moments can be created around their shared experiences, creating stronger impact by “bonding” the learning that happens to a personal experience.

Students and lecturers should care about the teaching and learning activities. These activities should require students to confront their emotional responses to complex clinical and ethical scenarios. The learning environment should support and validate students' emotional responses, and lecturers should be encouraged to share personal values and experiences as a way of modelling ways of thinking and being to students. This not only scaffolds a process of metacognition to students, but normalises the sharing of emotion. It may be necessary to fully explore sensitive topics in the classroom, as there are many aspects of communication that are relevant but which cannot be expressed fully in digital spaces (e.g. facial expression, body language, tone of voice).

Design principle 8

Are flexible

The learning environment should be a space to create and share the outputs or products of the activity but also enable informal interaction as part of a learning process. The curriculum should be flexible, in the sense that all components of the curriculum should be capable of adapting to the changing needs of students. As their real world learning experiences change and evolve, so the learning environment should evolve with them, while still providing structure to scaffold their development. Structuring the learning space narrows the scope of possible outcomes, allowing the student to explore the learning space either individually or with others, without feeling lost. It should be structured but not prescriptive in determining the “correct” paths to students' personal construction of knowledge. Structure can then be increased or reduced, depending on students' needs. Structure should not constrain opportunities for learning that arise in the real world through students' experiences.

The learning environment, teaching and learning strategies, assessment tasks, and content should all be flexible and adaptable. The learning environment should support students by responding and adapting to their experiences as they are articulated. The traditional boundaries of a curriculum (e.g. year level, modules, assessment tasks and even entire programmes) should be flexible, or permeable, allowing movement between “areas” of the curriculum. No single approach to teaching or learning can possibly lead to the variety of outcomes that a capable and competent practitioner needs for professional practice. Therefore, lecturers should make use of multiple teaching strategies, while students should be encouraged to use multiple learning strategies. This can be achieved by designing different types of activities that require different approaches to solving

complex problems. The role of the lecturer should also change in response to changes in students. Content can be added, removed, or modified, based on students' articulation of their understanding. Gaps in understanding can be addressed by changing content and activities around the content.

Design principle 9

Are immersive

Meaningful learning must happen in the physical and social contexts in which it is to be used. The learning environments must be immersive, leading students to become so involved in the activity that they think and behave as they would in the real world (i.e. there must be a sense of “cognitive realism”). Tasks are presented and completed using the culture and “tools” of the profession (i.e. language, values and social norms) in ways that expose students to ways of thinking and being a member of the community. Students make their own meaning of the world by engaging in authentic activities within the culture of the profession, enabling them to use the “tools” of the profession to engage as novice practitioners within it.

Technology (including online spaces), if present, is immersed within the learning environment and integrated with activities, rather than being a separate, isolated space. This should have the effect of making the technology transparent i.e. the students should not be thinking about the technology, as that would mean they are not immersed in the learning activity.

Note: The “Literacy” design principle was removed from Table 9.1, as there was not enough evidence to include its inclusion at this stage.

b) Describing the learning environment

Note that the draft design principles are not dependent on any specific technology, allowing educators to choose any platforms that have the affordances that would facilitate the implementation of the principle. The principle therefore drives the selection of technology, and not the other way around. Based on this set of design principles, we selected two different technology platforms that we believed would allow us to implement the blended learning module in the undergraduate curriculum. These platforms included using a self-hosted, private social network, and Google Drive. The social network was the same one that was used in the study described in Chapter Seven, modified slightly to create a separate space for the Applied Physiotherapy module. Google Drive was selected as a collaborative authoring space where students and facilitators could create content together. The use of Google Drive as part of this module is presented in more detail in Chapter Ten.

Table 9.2 below shows how each design principle was implemented in the learning

environment, in some instances based on the affordances of the technology platforms that we selected. It is noted that the principles do not prescribe a technology platform, and the specific tools we chose to operationalise the principles were based on the affordances of those tools. The next iteration of the project may see the introduction of new technology platforms with different affordances. The rate of change in the evolution of technology is far too rapid for educators to base learning activities on specific tools. Educators who wish to use technology should base their activities on the affordances of whatever tools are available and appropriate for what they need to achieve, knowing that the next time they will be able to use different tools. In other words, these design principles should be implemented in ways that are aligned with the specific contexts that educators find themselves in. Table 9.2 on the following page presents how we used a technology integrated approach to work through clinical cases in the classroom, using the design principles that had been developed.



Table 9.2: Table showing how the design principles were implemented in our context.

Draft design principles	How the principle was implemented in the learning environment
<p><i>Design principle 1</i> Facilitate interaction</p>	<p>Contact time in the classroom was used for interaction in ten small groups of 4-6 students each. Five to eight facilitators were present in the classroom, rotating between groups. This was done to model to students that there are different ways of approaching the same problem. Few lectures were given, and when they were, students were encouraged to ask questions at any time. It was emphasised that the classroom was for discussion of the clinical cases, and for clarifying concepts and misunderstanding.</p> <p>Online interaction was conducted using Google Drive and the social network. Google Drive was used by students to create their case notes, where they received feedback on their progress from facilitators. Time was allocated to facilitators for this. Students also shared reflections on their clinical experiences on the social network, which both peers and facilitators reviewed and discussed. Facilitators were encouraged to ask questions that stimulated further thinking, and peers tended to respond by sharing their own experiences in support.</p> <p>Digital resources (e.g. electronic documents, links to useful sources of information, and embedded videos) were shared with students, both in a shared folder in Google Drive and in the Applied group on the social network. In the social network, these shared resources showed up in an activity stream, which was interactive (i.e. students could “Like” and comment on the activity).</p>
<p><i>Design principle 2</i> Articulation of understanding</p>	<p>Facilitators were encouraged to model “not knowing” in order to create a space in which students felt safe to make themselves vulnerable by exposing their own lack of knowledge. Facilitators would often break off from a group to follow up on a question, or check a fact, coming back after having confirmed it with someone else. This showed students that it was okay to go somewhere else to find the answer. Facilitators were encouraged to avoid showing surprise or disappointment if students got stuck, or give the “wrong” answer. The culture in the class was for students to “have a go”, which would create a context for discussion, regardless of whether what was said was “right” or “wrong”.</p> <p>Facilitators were trained to avoid giving answers to questions, and instead to use guiding questions themselves in response. For example, if a student asked a facilitator if the condition in the case was Cerebral Palsy, instead of saying “Yes” or “No”, the facilitator might ask, “What makes you think that it</p>

	<p>is?” This would help students to create relationships between the information presented, and their hypothetical diagnosis. Facilitators were also encouraged to model their own thinking, for example, maybe by saying to students, “Well, this is how I understand it ...”.</p> <p>Each week, two different groups would present a slideshow highlighting different aspects of the case, presenting an overview of the week's work. These groups would be challenged by facilitators and other groups on the concepts covered during the presentation. This way, all groups had opportunities to see what they “should have” covered. All presentations were uploaded and shared with all other groups on Google Drive.</p> <p>Students were encouraged to bring their clinical experiences into the classroom, using the situations they encountered in the hospitals to discuss concepts that were being covered in class. This way, the theoretical concepts had a real world significance for students, and they were able to map the concept onto something that they had been a part of.</p> <p>All classroom and online activities were shared as part of a “public” space that everyone in the class had access to. Almost everything was shared with the group, demonstrating to students that sharing is valued as a part of the learning process.</p>
<p><i>Design principle 3</i> Build relationships</p>	<p>Students had to complete activities in groups. They needed to allocate roles within the group, set group norms and hold each other accountable for adherence to those norms. These were posted in their notes on Google Drive. Group members evaluated each others performance during the cases, giving feedback about what was being done well, and what needed improvement.</p> <p>Facilitators were always present in class, always part of the groups, always sharing their own clinical experiences, and always active participants in the learning process. We emphasised that our aims were to guide students towards deeper understanding of the profession, as opposed to gatekeepers who controlled access to the community.</p> <p>Facilitators modelled ways of thinking, doing and being (as well as modelling “not knowing”) in order to expose the hidden culture of the profession.</p> <p>Facilitators created a space where students could <i>fail gracefully</i>, with the understanding that <i>not</i></p>

	<p><i>knowing</i> is a valid place for a novice to be. However, the next step after identifying the <i>not knowing</i> was to collaboratively develop a practical plan of action that would help the student move towards better understanding.</p> <p>We emphasised that teaching and learning is a symbiotic relationship, with teachers and learners dependent on each other as part of the process of learning. We aimed to create online and physical spaces where learning was seen as an iterative process of development, rather than a means to an end. Teaching and learning was not mutually exclusive, but rather seen as a dynamic relationship between people.</p>
<p><i>Design principle 4</i> Embrace complexity</p>	<p>Boundaries within the module were broken down, with cases being designed to more authentically reflect the real world. Patients within cases were presented as having conditions and combinations of conditions that students would realistically see in a typical clinical setting.</p> <p>Clinical cases were complex in the sense that the path to completing the case was not prescriptive. Students saw that they could present multiple options for patient management, that all achieved the same objectives, highlighting that in the real world there are several ways to come to the same conclusion. Even though we reviewed and validated their solutions to the clinical problems, students were still very resistant to this concept, arguing that they needed to know what the “right answer” was. They wanted the safety of knowing that there existed a list of steps which they could use to solve the problems they were presented with.</p>
<p><i>Design principle 5</i> Encourage creativity</p>	<p>Students had to collaboratively create, structure, annotate, and reference their own notes. Very little content was simply provided to students. They had to identify gaps in their own knowledge, create objectives that aimed to fill the gap, develop research questions, search for information that answered the questions, filter out irrelevant or dubious sources, synthesise information from multiple sources, and summarise the work. This process led to the creation of personally meaningful knowledge that filled the gap the student had identified. We emphasised to students that this process of creating their own knowledge was to help them prepare for any conceivable situation. We wanted them to be able to solve any clinical problem they encountered, rather than only the ones we had prepared them for.</p> <p>Peer review and feedback from facilitators was integrated into this creative process, aiming to validate any new information presented, integrate the new information with what was already present, and</p>

	<p>expose new gaps in understanding so that the process could iterate.</p>
<p><i>Design principle 6</i> Stimulate reflection</p>	<p>Reflection was built into every activity by having facilitators question students' understanding at every stage of the case. Questioning was not aimed at eliciting information, but at stimulating further thinking and exposing logical inconsistency in students' understanding.</p> <p>Students had to reflect on their clinical encounters in small groups in the classroom, as well as write up reflective blog posts on the social network immediately following the encounter. In this way they not only provided further structure to their reflection through the act of writing, but were able to share the experience with a larger group than in the classroom.</p> <p>Facilitators and peers provided regular feedback on reflections, always aiming to validate the students' experiences, and provide additional stimuli that aimed to provoke further reflection. The social network provided a space for interaction and discussion around these experiences, soon after they had occurred.</p>
<p><i>Design principle 7</i> Acknowledge emotion</p>	<p>Facilitators created a safe space in which students could articulate their understanding without fear of recrimination or shame, where “not knowing” the answer was a normal part of the learning process.</p> <p>This group of students were exposed to real patients in a clinical context for the first time during the implementation of this intervention. We wanted them to share their emotional responses to the patients and conditions they encountered, so that we could help them develop a sense of empathy, rather than sympathy. Students were encouraged to share these emotional responses as part of their reflective blog posts.</p> <p>Facilitators validated students' emotional responses by engaging with them on the social network. We shared our own feelings and values, and discussed personal and professional challenges that we remembered as students. In addition, we also presented alternative viewpoints when we found students being insensitive. For example, many students expressed feeling a sense of disgust when first confronted with certain clinical situations. We validated the emotion by saying that this was a common response from novice practitioners. Then we would describe the same situation from the patient's perspective, trying to get the student to consider an alternative point of view. In most cases, students responded by saying that they hadn't considered what the patient might be feeling, and</p>

	<p>reported that the next time, they would try to be more sensitive to the situation.</p> <p>Facilitators shared personal experiences in the classroom and online spaces, especially noting when it was related to something that a student had described. We aimed to create a feeling of shared experiences within a community.</p>
<p><i>Design principle 8</i> Are flexible</p>	<p>The use of Google Drive and the social network allowed us to create online spaces for new content and new learning activities as we made observations and responded to student feedback. Activities in the online and classroom spaces were modified on a weekly basis, depending on what objectives we wanted to achieve.</p> <p>Clinical cases were developed collaboratively in near real-time using shared documents in Google Drive. One or two members of staff would lead the design of the case, but would have input from all other facilitators. Regular formal and informal meetings were held to discuss problems in the previous cases, and changes made in response.</p> <p>As we observed student interactions in the classroom, clinical and online contexts, we noted where we needed to make changes in order to try and address what we perceived as the areas in which they were lacking. For example, we could add content or an activity to the next case if we saw that students were struggling with a concept or practical technique, providing an opportunity to review the work.</p> <p>We changed the amount of structure provided in each case, altering it based on student feedback. Initially, students reported feeling “lost” and having no idea what to do. We responded by changing the format of the clinical cases to include guiding questions that students could use to narrow the focus of their case notes on Google Drive.</p> <p>Activities in the classroom were modified so that few sessions were the same. Activities included observation of practical techniques, building anatomical structures, bringing babies into the classroom to observe normal function, lectures, watching videos, and student presentations of their work. These activities were collaboratively developed and implemented by different facilitators.</p>
<p><i>Design principle 9</i> Are immersive</p>	<p>We created clinical cases that encouraged students to think and behave as they would in the real world. The aim was to develop within the activity a sense of “cognitive realism” that saw students</p>

interacting with the paper patients as if they were real people, and speaking about management as if the students were qualified therapists.

The language, behaviour and values of the profession were made visible to the students, exposing the often hidden culture that many struggle to access. The discussions around clinical experiences and cases created learning spaces where students “forgot” that they were in a classroom and that they didn't “like” studying. We aimed to develop within students a focused curiosity about the profession.

It took a while, but we eventually got a point where the technology was an integrated part of the environment, rather than a separate space. Initially, students complained that blogging wasn't part of being a physiotherapist. At the end, they were complaining that they weren't getting enough patient contact time (because they could read the reports from their peers on their blogs). This is when we saw that the technology was immersed into the activity, and was a transparent part of the process.

Table 9.2 shows some of the ways that the design principles were implemented in the module. Owing to the fact that concepts like *relationship* and *interaction* are difficult to represent as linear narratives, not all of the complexity of the process is described here.



In addition to using the design principles to make appropriate choices around the technology platforms, there was also the realisation that students would need access to the internet in the classroom. For this reason it was decided that students would bring their own mobile devices into the classroom, including laptops, mobile phones and tablets.

The need to know the capital of Florida died when my phone learned the answer. Rather, the students of tomorrow need to be able to think creatively: they will need to learn on their own, adapt to new challenges and innovate on-the-fly

Anthony Chivetta (n.d.)

Since we would not be able to buy hardware for all of the students in the class, we wanted them to bring their own devices and use them as part of the process. It seemed to work well, with students getting accustomed to using the internet as part of a research process. A few months after implementing the blended learning module, I wrote the reflection below on my blog, documenting how students were using mobile devices in the classroom.²⁸

For the past 2 months we've been operating under a bring-your-own-device (BYOD) policy in one of the modules I'm co-ordinating. Actually, it's the module that I'm evaluating for my PhD, and the BYOD policy is just one component of a completely restructured approach to the curriculum.

Some background: Physiotherapy students work to solve clinical problems (in the form of cases) in small groups. They set their own learning objectives related to management of the patient in the case, and have to do basic research after identifying gaps in their knowledge around the case. They work in Google [Drive] to collaboratively develop case notes based on their research, and we (the facilitators) provide feedback on [Drive] to help guide students towards developing a reliable set of notes.

²⁸ The full post is available at <http://www.mrowe.co.za/blog/2012/03/bring-your-own-device/>

We had to make sure that we had reliable wi-fi in all the venues we're using, which meant having a router installed in someone's office to make sure that we had the coverage we needed. We knew that we'd never be able to provide the devices for the students, so we told them that, in addition to using the recommended textbooks for the module, we're encouraging them to bring whatever devices they own, to use in class.

So far it seems to be working well. Students began the module by setting group norms, one of which (we were surprised to see) was that students using the devices had to be using it for the benefit of the group. We've had cases where group members have asked their peers to get off Facebook / stop SMS'ing and start researching. We don't police the students and trust that they're using the devices to advance their groups understanding of the case. We also see them updating their case notes during the class, and setting each other homework tasks.

It seems that this process of encouraging students to bring their own devices into the classroom has its benefits, with disadvantages. We did have to ensure that they would have access in all areas of the department, which meant having another wireless router installed.

The development of the design principles presented in Table 9.2 (above) led to the introduction of changes within the module that addressed some of the ways in which higher education has lagged behind society in terms of making appropriate use of technology. Chapter One presented some of the ways in which higher education has not kept pace with society in general (Table 1.2). Table 9.3 below demonstrates how changes made in this module go some way towards addressing the concerns of Wiley and Hilton (2009) in order to better align higher education with the rest of society. The table below highlights how the traditional approach towards teaching and learning changed in the Applied Physiotherapy module as a result of the design process.

Table 9.3: Examples of how changes in this module helped address some of the ways in which higher education needs to change

Traditional approach	Blended approach
<p><i>Analogue</i> All course materials were given to students as a printed course reader. If handouts, presentations or other materials were necessary for the module, they were printed and handed out in class.</p>	<p><i>Digital</i> All course materials were made available online, either in Google Drive, or in a <i>Documents</i> folder in the social network. If webpages were used as resources, links were posted into the <i>Applied Physiotherapy</i> group on the social network. Course notes were developed as a Google Document and shared with the class and facilitators in Drive. Videos of practical demonstrations in the classroom were uploaded to YouTube and then embedded in a <i>Resources</i> page on the social network. Weekly summaries of coursework were created in Google Drive, presented in class, and then shared with other students.</p>
<p><i>Tethered</i> Students had to attend class at specific times for lectures, and to receive their course readers and handouts necessary for the module.</p>	<p><i>Mobile</i> While classes were still conducted at set times, students could connect to their Drive account from any device with an internet connection. They could edit their notes, retrieve resources, watch practical demonstrations, and comment on each others work from anywhere, at any time.</p>
<p><i>Isolated</i> Students worked in isolation, both in class and at home. Even when sitting in class, surrounded by others, each person was effectively isolated in terms of how they could construct meaning. Conversation between students during lectures was forbidden (unless the lecturer had decided it was “time for discussion”). Students made their own notes and were reluctant to share them with others.</p>	<p><i>Connected</i> All coursework was designed to be completed in small groups. In fact, success in the module required collaborative work. Students developed their notes collaboratively in groups, shared weekly summaries with the class in Google Drive, posted weekly clinical reflections as reflective blog posts in the social network and commented on each others reflections. Most contact time in the classroom was taken up with small group discussion, guided by a facilitator.</p>
<p><i>Generic</i> All students received the same lectures, the same course readers, and the same handouts. Students could ask questions in class that were meaningful to them, but in</p>	<p><i>Personal</i> Students were free to create their own notes, with whatever information was meaningful to them (under the guidance of facilitators). They could explore avenues</p>

Traditional approach	Blended approach
<p>practice, questions from students were rare.</p>	<p>that the case designers had not considered. Each group could end up having different conversations with facilitators, depending on the needs of the group members. Facilitators had a broad “script” that they ensured each group covered, but the conversations were unique to the group. Students could gather any content that was relevant to the questions that their group generated. Interaction on the social network was not structured, with students being free to share and discuss any topic that arose during their cases or clinical visits.</p>
<p><i>Consumers</i> Students were expected to use the course readers and handouts they were given. Reference was made to external sources, but in reality, assessment tasks (e.g. tests and assignments) were guided mainly by the content in the course readers. Students were encouraged to take their own notes during lectures, but few students did this, as they knew that the assessment would be based on the unaltered notes. Students would memorise as much of the content as they could, as success was determined by how much they could reproduce during tests and exams.</p>	<p><i>Creators</i> No course content was given to students, so that they could create their own notes, using content that they gathered in response to the identification of their own learning objectives and research questions. They also created their own summaries of their notes. The students were therefore responsible for creating all content that they felt was important <i>for them</i>. In this way, they moved from being consumers of content that lecturers had created, to being creators of their own content.</p>
<p><i>Closed</i> Students' individual work was not available to others in the class, and lecturers only saw the final products of assessment tasks that were submitted, never the process of creating the product. The module was closed in terms of student input to the direction and pace of the lectures. Students were not encouraged to contribute to the development of the module, other than to complete module evaluations at the end.</p>	<p><i>Open</i> All course notes, summaries and resources that had been gathered by all the groups were available for all other groups, at all stages of the process. The module was developed transparently with regular student input. Student feedback was used to make changes to the module, which was fed back to students at the beginning of each case, shared as documents on the social network, in Google Drive and in class. We encouraged students to voice their discontent and to work with us to improve the process in public discussion.</p>

c) Designing the clinical cases

The clinical cases were designed using principles of authentic learning and authentic tasks and are described in more detail in Chapter Ten. However, examples are included here to demonstrate how the online space was used collaboratively by facilitators at all stages during the process (See Illustration 9.1 and 9.2 below).



Case 6 - Student guide ☆

File Edit View Insert Format Tools Table Help Last edit was made 10 hours ago by [redacted]

Comments

Share

Normal text Arial 11 B I U A [redacted]

Examples

8. Analysis and interpretation of orthopaedic and neurological injuries caused by GSW
9. Acute orthopaedic / surgical management of GSW injuries
10. Social implications and health consequences gangsterism in the South African context

Human rights in health

Introduction to section 1

You have received a referral for Mr J. Upon reading Mr J's medical folder you obtain the following information: Mr J was shot by in the ~~right~~ arm and ~~right~~ chest area. Entrance and exit wounds were found for bullets in arm. The bullet that entered the chest had no exit wound but entry wound was found at ~~right~~ axilla. During the attack he was struck with heavy brick on his ~~left~~ lower leg and presents with massive bruising and swelling. Mr J's ~~right~~ upper arm is swollen. He was brought into the emergency unit several hours after the shooting, accompanied by an armed police officer. Mr J now complains of numbness, weakness and burning sensation on right arm; weakness in right lower limb; only slight pain in left lower limb. The doctor has stated no mobilisation should be done.

Ethical Dilemma

Use the questions below as an overview for working on the 7 step process:

What do you know?

What do you think you know?

What do you need to find out?

Step 1: Clarify Terms

Revision history

Today, 11:37

Sep 6, 12:23

Sep 5, 01:22

[Restore this revision](#)

Sep 5, 00:09

Sep 5, 00:08

Sep 4, 23:48

Sep 4, 23:45

Sep 4, 23:16

Sep 4, 21:31

Sep 4, 19:15

Show changes

Show more detailed revisions

Illustration 9.1: Example of how Google Drive was used to collaboratively create the clinical cases.

Tasks were created during the development of each case, and assigned to facilitators for completion. That way, input was received from multiple sources, and no single person had the responsibility of developing an entire case, or making decisions about assessment tasks in the module.

Tasks for cases ☆

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€ % 123 12pt B Abc A A

Task list for case development

A	B	C	D	E	F
	Task details	Assigned to	Complete by	Status	Comments
Tasks for Case 1					
Case-specific learning outcomes	Intended Learning Outcomes (ILOs) for the case must be specific to the case, and not generalised to the module		13/01/2012	Completed	Left outcomes as module-specific, not case specific. We need to ensure that all of our cases (in total) reflect the module outcomes.
Assessment task (case test)	Online "open-book" assessment for Case 1, short, low stakes		13/01/2012	Completed	
Assessment task	1 applied question per week, not knowledge-based; (complete / incomplete); low stakes, "open-book", using Forum discussion feature		13/01/2012	In progress	Removed assessment task from this case
Assessment Outline	A guide as to what is expected in each assessment task		13/01/2012	Completed	
Naming consistency	Ensure that the words "Guide" and "Section" are changed throughout all of our current documents. From now on, we should all try and use the new naming convention		13/01/2012	Completed	
	Ensure that				

Illustration 9.2: Task allocation table demonstrating how different tasks were tracked.

d) Cool stuff

I wanted to help students think about *learning* and *being* in different ways, so I tried to share images and videos that were not directly related to the Applied Physiotherapy module. In this spirit, I created the “Cool stuff” page in the social network, where I shared content that went outside the scope of the module, trying to get students to think differently about their time at university. I wanted to emphasise that “creativity is as important now in education as literacy, and should be treated with the same status” (Robinson, 2006). I wanted them to think of learning not as memorising content, but as a process of *becoming* that never really ends. I wanted their learning spaces to be inspirational, as well as educational. See Illustration 9.3 below for examples of images I shared that tried to introduce them to ways of thinking, learning and being that were outside of their traditional perceptions.

Connected Learning Manifesto
a collaborative statement on teaching & learning in the digital age

We believe in **messy learning** within a culture of **collaboration**. Through non-linear, non-directed, self-initiated learning, collectively we find and **solve problems** within our networks, classrooms, communities, and the world.

Be a **learner first**, educator second. **Never stop learning.** It's all about asking hard questions and then **listening deeply**. It's a **synergy** that creates something greater than it's individual parts and fertilizes your thinking.

Embrace **failure** as a learning strategy. You are teaching when you are **transparently sharing**. You are leveraging your passion to help others understand.

Community is built through the co-construction of knowledge. Pacing guides and scripted curricula should **die**. Experts are at your fingertips. **You are never alone.**

Connecting makes our thoughts and actions **stronger**. I believe that the collective **wide open learning**.

Connections increase **serendipitous** learnings. **WE** is always smarter than **ME**. **Honor the gifts and talents** each learner brings to collaborations.

Bring your passion. **Selflessly share** what you know. **Be collaborative.** Own it. Share with others. **There's nothing powerful about mere technology.** **Real power** rests in the hearts and minds of those I learn with online. **To question is the answer.**

Want to learn the most? Bring people not like you into your network. **Learn first, lead second.** **Connections enhance individual reflection.** Connected learners are never lonely. **Fail Forward!** **Think, share, and then act collectively.**

Cell phones ARE learning tools. Relationships CAN be built 140 characters at a time. **Connected learning is entrenched in a culture of action research and evaluation.**

THIS IS YOUR LIFE.
DO WHAT YOU LOVE, AND DO IT OFTEN.

IF YOU DON'T LIKE SOMETHING, CHANGE IT.
IF YOU DON'T LIKE YOUR JOB, QUIT.
IF YOU DON'T HAVE ENOUGH TIME, STOP WATCHING TV.
IF YOU ARE LOOKING FOR THE LOVE OF YOUR LIFE, STOP; THEY WILL BE WAITING FOR YOU WHEN YOU START DOING THINGS YOU LOVE.

STOP OVER ANALYZING. **LIFE IS SIMPLE.** EVERY LAST BITE. ALL EMOTIONS ARE BEAUTIFUL. WHEN YOU EAT, APPRECIATE.

OPEN YOUR MIND, ARMS, AND HEART TO NEW THINGS AND PEOPLE. WE ARE UNITED IN OUR DIFFERENCES. ASK THE NEXT PERSON YOU SEE WHAT THEIR PASSION IS, AND SHARE YOUR INSPIRING DREAM WITH THEM.

TRAVEL OFTEN; GETTING LOST WILL HELP YOU FIND YOURSELF. SOME OPPORTUNITIES ONLY COME ONCE, SEIZE THEM. **LIFE IS ABOUT THE PEOPLE YOU MEET, AND THE THINGS YOU CREATE WITH THEM SO GO OUT AND START CREATING.**

LIFE IS SHORT. LIVE YOUR DREAM, AND WEAR YOUR PASSION.

THE HOLSTEE MANIFESTO ©2009 WRITTEN BY DAVE, MIKE & FABIAN DESIGN BY RACHAEL WWW.HOLSTEE.COM/MANIFESTO

Cool stuff

This page is a place for me to share things that I consider to be cool. It's not formally part of the curriculum, but which you may find interesting nonetheless.

Augmented reality in healthcare



In both of the pictures above, the augmented reality system, which can be viewed through your cellphone or a pair of glasses, overlays contextual information on top of the real world. In other words, you see the real world through the augmented reality system, which then also adds a digital layer with extra information on top of that view.

- [Some cool applications of augmented reality in healthcare](#)
- [Short article on augmented reality in healthcare](#)

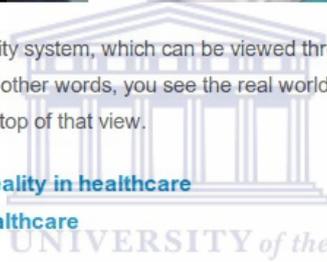


Illustration 9.3: Example of a page on the social network where I tried to introduce students to aspects of healthcare that went beyond the traditional module.

9.3. Implementing the blended learning module

This section describes the actual implementation of the design principles in the classroom and online contexts. I present how the module was implemented, how we monitored the process by gathering feedback from students during the module and what changes we made as a result.

a) Implementing the module in the classroom

The Applied Physiotherapy module was run over two semesters, from January to November in 2012. There were three sessions of classes during the week, with each

session lasting two periods (about one and a half hours). Previously, most of that time would consist of lectures and practical classes. The first week of the first semester was used to orient the new students in the blended learning module. We did presentations in class to introduce the new module, described how it would work, how and why it had changed, and used ice breakers to get the students comfortable with each other in their first groups.

In general, the module was run in a case-by-case format, with each case taking three weeks to cover. This meant that each case was split into three sections, with each section introducing additional complexity and research opportunities for students to explore the knowledge and skills required to manage the case. The following outline demonstrates how a typical case was run.

Week 1 – Introduction of the case

- Monday: Students received a handout of the first section of the case and went through the problem-based learning process in their small groups. They began uploading and creating content on Google Drive, which facilitators and other groups could immediately review and comment on.
- Tuesday: Facilitators gave a short, interactive lecture and / or practical demonstration that served to illustrate the principles learned on the previous day. Lectures covered major concepts that we needed students to be aware of, and often included videos (e.g. of abnormal gait patterns) in the presentations.
- Wednesday: Students used face-to-face contact time in the classroom to finalise their notes from the first week, presenting their group's work as a summary.
- Thursday: Students went on clinical visits to see patients who had similar presentations to the cases covered in class. Students were expected to apply the principles learned in class while they were working with their patients. The following example shows how this process might have proceeded, using increased muscle tone as a concept covered in the module:
 - Monday: Students learnt about the impact of hypertonicity on functional ability, as part of the clinical case they were exploring in the classroom.

- Tuesday: Facilitators conducted a practical demonstration of the functional assessment of a patient with hypertonicity.
- Wednesday: Students spent time in the classroom clarifying the terms, concepts and procedures that were covered during the week, create summaries of their work, and presented this to the class. They were challenged on their work by both peers and facilitators and needed to defend what they had created.
- Thursday: Students visited patients presenting with hypertonicity in different clinical settings, and in different small groups, and used concepts learned in the classroom to try and better understand the patient presentation. Putting students in different groups meant that they had more chances to learn from other students, who they may not be working with in class.

The following week, the process would begin again, with a new aspect of the case being presented to the students, adding additional variables and further complexity. This was usually in the form of a new condition, or complication of the existing condition.

b) Monitoring engagement in the classroom and online

In addition to the more formal studies and observations of student and facilitator behaviour during the process, there was a significant amount of informal data that was generated.

Using analytics in YouTube

Students asked for permission to take videos of facilitators performing practical demonstrations in class. The videos were uploaded to YouTube as part of a private channel that only the students could see. We then embedded and shared those videos in the *Applied Physiotherapy* group in the social network (See Illustrations 9.6 and 9.7 below). We also included other videos of procedures on patients that we thought would be useful for students during certain aspects of each case. Eventually, students were sharing videos of patient management techniques with each other.

The screenshot shows the YouTube Video Manager interface. The top navigation bar includes 'Video Manager', 'Video Editor', 'Subscriptions', 'Analytics', 'Inbox', and 'Settings'. The main content area is titled 'Uploads' and shows a list of five videos. Each video entry includes a thumbnail, a title, a timestamp, an 'Edit' button, a lock icon, and view statistics (views, likes, dislikes).

Video Title	Duration	Timestamp	Views	Likes	Dislikes
Assessment of a patient (Liezal & Berenic...	38:41	May 7, 2012 3:31 PM	30	0	0
Moving a patient with neurological dysfunc...	21:18	May 6, 2012 5:43 PM	43	0	0
Assessing balance (Michael & Danelle)	19:13	May 6, 2012 2:36 PM	37	0	0
Intercostal chest drain insertion (part 4)	1:04	March 30, 2012 11:56 AM	10	0	0
Intercostal chest drain insertion (part 3)	1:26	March 30, 2012 11:53 AM	8	0	0

Illustration 9.4: Index of uploaded video files available on YouTube.

The image is a screenshot of a YouTube video player. At the top left is the YouTube logo. A search bar is located to the right of the logo. Below the search bar is a dark grey navigation bar with buttons for 'Edit', 'Enhancements', 'Audio', 'Annotations', and 'Captions'. The video title is 'Moving a patient with neurological dysfunction'. Below the title are buttons for 'theboatashore', 'Subscribe', and '2 videos'. The video player shows a scene in a classroom or lecture hall. A man in a grey jacket is standing and speaking to a group of people seated at tables. A patient is lying on a gurney in the foreground, being rolled. A watermark for 'UNIVERSITY of the WESTERN CAPE' is visible over the video. The video player controls at the bottom show a play button, a volume icon, a progress bar at 0:15 / 21:17, and icons for comments, settings, and full screen. Below the video player is an orange banner that reads 'This video is unlisted. Only those with the link can see it. [Learn more](#)'. Below the banner are buttons for 'Like', 'Add to', 'Share', 'Download', and a print icon. To the right of these buttons is a view count of '43 views' and a thumbnail icon. Below the buttons is the text 'Uploaded by theboatashore on May 6, 2012' and a description 'demonstrating how to roll a patient with neurological dysfunction.' with '0 likes, 0 dislikes' below it.

Illustration 9.5: Example of an embedded video that was filmed by a student, and shared on YouTube.

We also made use of the YouTube and embedded videos to provide technical support to students, as can be seen in Illustration 9.8 below.

Using Google Docs to structure a document

theboatashore Subscribe 2 videos ▾

Intercostal chest drains - Google Docs - Google Chrome

https://docs.google.com/a/realmdigital.co.za/document/d/1Xf2hd5-tpxpk-MixGAgncVVRUghe-hjNDzm5B7aohCV/edit

Intercostal chest drains

File Edit View Insert Format Tools Table Help Saving

Technique

Chest drain

Here is a picture of an chest drain

8:06 / 17:28

UNIVERSITY of the WESTERN CAPE

This video is public.

Like Add to Share Download ▾ 49 views

Video statistics Make these stats publicly visible View more stats

Views and discovery

49 Views

02/19/12 06/26/12 11/02/12

Illustration 9.6: Using YouTube to host screencasts of short "tutorials". Note the statistics indicator at the bottom.

Access statistics

From the graph in Illustration 9.9 below, it is clear that in order to have students interact in the activity, it needs to be made a requirement. Note the increase in activity level (logging in, creating posts and commenting on posts) after we explicitly required reflective blogging of clinical visits.

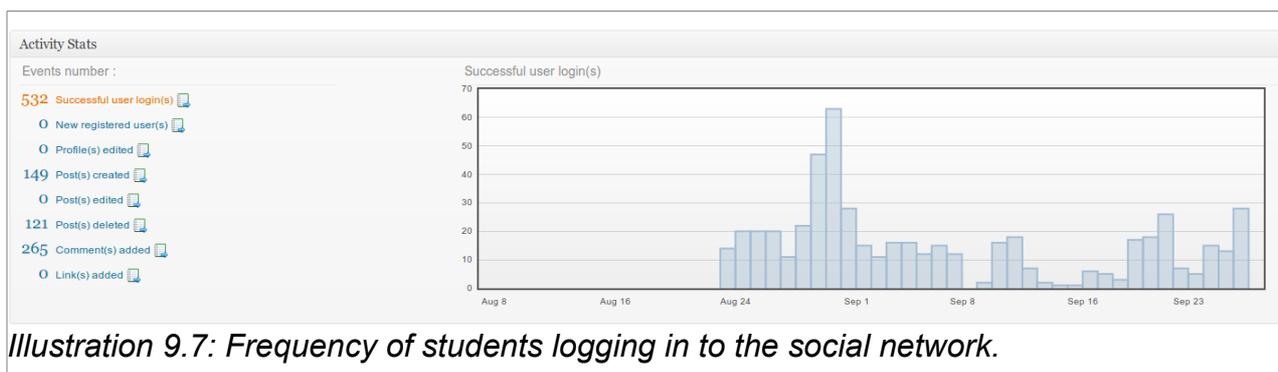


Illustration 9.7: Frequency of students logging in to the social network.

Prior to this, students wrote their reflections in clinical files, which were not shared and where feedback was only given to them at the end of the term. Conducted in this way, students would write 4-6 reflections without receiving any kind of feedback. Then, when we gave feedback, they had already moved on to the next rotation and were no longer interested in something they had written almost two months ago. We decided to make blogging of the reflections a requirement, so that we could give feedback at any point in the process. We allocated time and students to facilitators who would follow up on student blog posts once a week and provide feedback as comments. It seems clear that if we want students to engage in online activities, then we need to make the activity an explicit requirement, just as we would with any other assessment task.

Informal student feedback through discussion with facilitators

Students met with facilitators to discuss their concerns with the changes being made in the module. The facilitators took notes which were shared on Google Drive for everyone to see and provide feedback on. In this way, students could see that their input was taken seriously and considered, and also why certain changes were made and others were not.

Feedback from individual informal conversations with second year student concerning Applied 203 on 29th February 2012

What we're experiencing

- The Case is too long
- We're researching the same things over again
- It becomes boring, we're talking less & less as the case progress
- We learn better if the facilitator is present for the entire process, guiding the group, questioning us
- I learn the most during Tuesdays, I enjoy Tuesday
- don't mind the research but believe teaching should still be done

Suggestions for improvement

- Have the 1 Case over 3 weeks
- Week 1: only theory & learning outcomes, Week 2: Feedback broader knowledge & knowledge specific to case patient. Week 1 & 2 practical sessions
- Have more tutorial sessions

Our concerns

- If the case could be shorter, will we still be able to cover all the information need?
- Do we have all the required knowledge? When I speak to my friends they are on other levels & they have researched other things than our group
- Tuesday notes are not available on the social network
- Are our notes accurate?
- I feel uncertain about practical techniques

Comment 1: 18:18 1 Mar 2012
 Resolve
 These are all relevant comments. I got a phone call from a student to discuss and she is busy preparing a document from a group of students. This is a good thing. We will discuss when I get back. We can't make changes to Case 1 but we can use this feedback to develop Case 2.
 Edit Delete
 Reply to this comment...

Comment 2: 15:42 11 Mar 2012
 I agree, this is when they learn the most facts, which is where they place the highest value. They don't learn anything about solving problems. Part of the process is shifting the value proposition from knowing facts to being able to think. But thinking
 Show more

Comment 3: 16:59 17 Mar 2012

Illustration 9.8: Example of informal student feedback that was communicated to all facilitators, along with the conversation that followed it.

Students also met in groups and discussed their concerns over the various changes made in the module, made notes, and then shared those notes in Google Drive. It is clear that facilitators read the concerns and discussed them. Through this process, changes were made in each case, as well as to teaching strategies and assessment tasks, which were then reported back to students at the beginning of each subsequent case.

Summary of student feedback ☆

Comments

Share

File Edit View Insert Format Tools Table Help All changes saved in Drive

PBL process

- Too much research and referencing
- Uncertainty regarding "what is right"
- Covering same content at different times, becomes boring
- "Expected to teach ourselves"
- Students want learning outcomes at the end of each week, so that they know what we have identified as being important. More structure is needed.
- "Learn more in Tuesday's practical time"
- Want more balance between research, notes and lectures. "Teaching" should still be done.
- Uncertain of the process
- Case is too long

Content

- Students want notes / hardcopies, as they feel they are paying lab fees and not getting anything back
- No notes to review for **PHT110**
- They worry about not having enough "background knowledge" but didn't elaborate on what this means
- Have difficult finding content "online or in books"
- Need a standardised way to explain and demonstrate techniques, and notes should be given

Facilitation

- Inconsistency in terms of process (e.g. what to do next) and content (e.g. what is important) - suggestion of rotation to get input from different facilitators
- Facilitator training would be useful, as facilitators not sure how to guide
- Not enough facilitators leading to times when students stagnate without guidance
- Difficult to facilitate 2 groups

16:40 17 Mar 2012
Yes, they are expected to teach themselves, that's the point. However, we can provide more structure.

22:06 19 Mar 2012
Agreed.

16:47 17 Mar 2012
However, no idea what "learn more" means, and no way to validate.
Edit Delete

13:43 19 Mar 2012
Are they not perhaps referring to the practical components? Are you including specific techniques that are shown and practised in these sessions? Not sure how it is structured though, so maybe you right that it is not clear.

22:04 19 Mar 2012
They might not actually learn more in the way that we understand it, but I think they feel more comfortable because they are receiving content in a more structured manner on a Tuesday, so that's what the process facilitators

Illustration 9.9: Example of a summary of a student group meeting, along with discussion of facilitators.

WESTERN CAPE

Something that is only touched in the examples of feedback provided here, was students' insistence that they be "given the notes" for the module. They wanted the course reader, which they were still getting in other modules, that showed them exactly when they "needed to know". This is not uncommon when teachers move to inquiry-based learning, with students expressing a strong desire for the content, as if it represents a piece of knowledge that has been given to them. However, this only leads to dependence and conformity, with no requirement for the student to think about the work, only to memorise it (Ovens, Wells, Wallis & Hawkins, 2011).

In addition to this informal student feedback, we also used Google Forms to create surveys for students to complete during the module (see Illustration 9.12 below). These surveys were more in-depth and so took longer to complete. This may be why the

response rate was so low (n=14) and why we therefore didn't use these surveys often. The results from this survey are not presented formally as part of this study, but did serve to inform changes made to the module. The first set of student responses below clearly shows the level of dissatisfaction with certain aspects of the module. While it was difficult to read, the students raised valid points, which were able to use in order to make important changes.

Survey after case 1 ☆

File Edit View Insert Format Data Tools Form (14) Help Last edit was made on by michael

€ % 123 10pt B Abc A A

Timestamp	What worked well in the small group sessions during the week?	What do you think worked well?	What didn't work well in the small group sessions?	How can the small group sessions be improved?	What do you think didn't work well?	How can the facilitation process be improved?	What worked well with the online components?	What didn't work well with the online components?	What can we do to improve the online components?	Is there anything else you would like to comment on, either positive or negative?
19/03/2012 14:58:52	we could all collaborate our gathered information and learn from each other	only that if we were lost or confused they could help to an extent but most of the time the answers we got were just to go research it. this is silly because we pay fees to get given material to have a basis for our learning. I could stay at home and just research my course and have no need to come into varsity.	Most people rely only on one person in the group and expect them to do everything. this is very frustrating	everyone must have equal contribution, even though we are in groups we must not rely on each other so much. The work we are required to do needs to be more individually based, rather than having to rely so much on a group.	the facilitators didn't even know what was going on sometimes. They were just as lost as us and often they were not on the same page! we were told different things from different people and this was very confusing and frustrating.	have regular meeting to make sure everyone knows what is going on. most facilitators were very helpful but certain people were on their phones and not helping there group	Google docs we could see our information clearly and also view what others uploaded. social network was good to sort of keep informed videos were handy	internet access 24/7 is not possible for many people and this caused many delays. I really don't like the whole Google Docs thing, its like writing an essay where you have to have content that is always referenced and a full explanation is always required. Sometimes I cannot find the answers, online and	more notifications and updates but not to be so based on going on the internet. we need to be told face to face what is going on because there is always a lot of confusion	
				Maybe have a report back to the class or the facilitator after a certain amount of work has been done. That way it's like working towards a goal that						

Sheet1

Illustration 9.10: Using Google Forms to create surveys for students to provide feedback.

Polls conducted each term using the social network

A plugin for the social network allowed us to take short surveys during the term. Each poll consisted of a question with four possible answers, and students were encouraged to take part in these. Illustration 9.13 below demonstrates how the polls could be managed.

Manage Polls

Polls

ID	Question	Total Voters	Start Date/Time	End Date/Time	Status	Action
7	Displayed: Did you use the blog posts of other students to prepare for your clinical tests?	40	August 10, 2012 @ 09:53	No Expiry	Closed	Logs Edit Delete
6	What will help your clinical reasoning?	38	July 14, 2012 @ 12:11	No Expiry	Closed	Logs Edit Delete
5	How do you currently feel about Applied?	27	April 11, 2012 @ 17:50	No Expiry	Closed	Logs Edit Delete
4	How do you feel after the first session?	44	February 6, 2012 @ 11:18	No Expiry	Closed	Logs Edit Delete
3	What was your first impression when we introduced you to the module yesterday?	64	January 30, 2012 @ 22:38	January 31, 2012 @ 16:00	Closed	Logs Edit Delete

Polls Stats:

Total Polls:	5
Total Polls' Answers:	18
Total Votes Casted:	213
Total Voters:	213

Illustration 9.11: Example of the types of polls that were conducted in order to get a "snapshot" of students' feelings at different points in the module.

c) Changes made during the early implementation of the module

As a result of the regular feedback we received as part of this process, we were able to iterate and make changes to the module relatively quickly. In this way, students' frustration with things that were not working well did not continue for very long, as we were able to adjust almost immediately.

One of the major changes that we made relatively early on was when we realised that the wiki feature of the social network could not support the kind of collaborative work we expected in the module. Initially, facilitators used a wiki in the social network to present the clinical cases to students, and students would then work within the same space to create their notes. This had the advantage of having only one online "place" in which student

work had to be completed (i.e. discussion and dialogue around clinical cases and visits, and collaborative content creation).

However, the disadvantages included increased complexity, with students not feeling comfortable using the wiki in the social network because the user interface was not intuitive or user friendly for either students or staff. In addition, there was no simple mechanism by which facilitators could leave comments and suggestions on students notes. They had to use different colour text and append their names to each comment. It is noted that wikis provide a record of edits made by users, but that this requires students to visit the page history.

We also wanted to make it easy for students to export content out of the wiki so that they could download it and print it out, which was difficult when it existed as a webpage. Even after installing a plugin that converted the HTML into a printed document, students found the paradigm shift between webpage and paper page difficult to negotiate. In addition, students often had to wait to add their own work because another student was busy editing the wiki, and it had therefore been “locked” and unable to be edited. In this case, true collaborative working was impossible. Based on the feedback from students and staff, it was decided after one week to shift the collaborative case note development from the wiki in the social network, to Google Drive.

Initially, students did not need to create summaries of their work each week. However, we soon realised (with the help of the students) that they were feeling as if they were progressing through the case without knowing if what they had covered the previous week was “correct”. Because of this, they were struggling to build on a solid foundation of knowledge, meaning that the work being covered in subsequent weeks was largely lost to them, without having a stable base on which to build. We decided after a few weeks that they should do weekly summaries of the case, which would be presented to the class, corrected and given feedback by facilitators, and uploaded and shared on Google Drive.

Initially, students raised concerns about the quality of the input they were receiving from

their facilitators, who were assigned to their group for the duration of the case. The students raised valid points and highlighted that some of our facilitators were more prepared than others. We decided that facilitators would rotate between groups, thereby exposing students to a range of different approaches to the clinical problems. We also felt that facilitators who lacked experience would also benefit from this process, as they were exposed to different groups of students.

Finally, the other significant change that was implemented in the early stages was around the length of the case. Initially, we designed cases to run over six weeks but soon realised that students quickly became bored discussing the same patient for such a long period of time. We changed the cases so that each would only run for three weeks. This would allow us to keep students' interested, as well as cycle through more conditions within the cases.



9.4. Conclusion

Chapter Nine began by presenting the final set of draft design principles that had been informed by studies presented in Chapters Five to Eight. These principles were then used to design the learning environments, which included both online and physical spaces. The selection of technology platforms was described, including how the affordances of the platforms helped the researcher operationalise the design principle. A brief description of the clinical cases was given in order to highlight the kinds of learning activities that students needed to complete. Some examples of using the online space to create the cases was given, highlighting the collaborative nature of the development process.

The module was then described in terms of the time period during which it was implemented, as well as how the process was monitored. Examples were given of how students and staff members participated in an ongoing, iterative approach to refinement and improvement of certain aspects of the blended learning module. Finally, some of the changes that were made during the initial phases were described, highlighting the fact that there were significant challenges that arose early on. The importance of student feedback as part of the process is made, demonstrating that their feedback is an integral part of the design. It is important to note that only a few examples of this process are presented in this thesis, and that the collaborative nature of the feedback and review process were significant.

The aim of this chapter was to describe the design and implementation of the blended learning module, using the final set of draft design principles to guide the process. Chapter Ten presents the results of an evaluation of the module six months into the first iteration of the intervention.

9.5. References

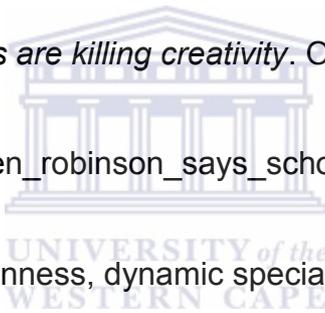
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10. Chapter Ten: Authentic learning in online spaces

A fearless adventure in knowing what to do when no one's there telling you what to do.

Valve Handbook (2012)

10.1. Introduction

Chapter Ten describes the initial outcomes of an innovative approach to changing teaching and learning practices in an undergraduate physiotherapy programme. This chapter begins by discussing the limitations of the dominant use of technology in higher education, and then describes one example of how technology might be used as part of a blended approach that is based on strong theoretical foundations.

One of the challenges in higher education is to create an environment that does not separate the “learning” from the “doing”, and where students are not constrained in the activities that would lead to the most effective, personally meaningful opportunities for them. In other words, teachers should explore the use of technology platforms that are adaptable, not only by the teacher, but by students who may need to change the direction, pace and depth of their own learning. When knowledge and context are separated, knowledge is seen by learners as a product of education, rather than as a tool they can use, which has a negative impact on their ability to transfer knowledge learned in the classroom, to the clinical context. The next section of the chapter describes a dominant use of technology in higher education, which does separate knowledge and context.

10.2. Learning Management Systems and dominant design

Dominant design describes an emergent core design principle that arises from competing alternatives. Once the design is prominent, innovative activity is directed towards improving the dominant design, rather than exploring alternative approaches (Abernathy & Utterback, 1978). The concept of dominant design is a useful framework to consider the use of the Learning Management System (LMS) in higher education. It has already been

noted that the predominant use of technology in higher education has been to transmit more content, to more students, more efficiently, instead of fundamentally changing teaching and learning practices (Veletsianos, 2011). The very structure of the LMS directs teachers towards activities that decontextualise learning by creating boundaries in which courses are constructed as islands, separate from the bodies of knowledge and practices from they are generated and on which they focus (Boud & Falchikov, 2006). When considered against the approaches to learning that have been discussed so far, it is clear that it would be difficult to use the LMS to explore teaching practices that facilitate collaborative, authentic learning opportunities.

Herrington, Reeves, and Oliver (2005) argue that learning management software leads institutions to “think they are in the information industry” (p. 356). In contrast to authentic learning spaces that are informed by cognitive and constructivist learning theories, the LMS model emphasises teachers generating content, gathering resources, grouping and sequencing information, and then passing that information on to students. This emphasis on higher education as a content delivery mechanism has the potential to damage the perception of the use of technology in education, as well have a negative influence on student learning.

While it is evident that the use of the LMS in higher education has little impact on qualitative learning outcomes, it continues to be the dominant strategy used when trying to integrate technology into practice. Even though the approach is fundamentally flawed, institutions (and teachers) continue to implement and devote resources to a design that is outdated and restrictive. Teachers should explore innovative ways to integrate technology into teaching and learning, rather than rely on institutional platforms that are rooted in models that envision higher education as closed-off silos that constrain learning.

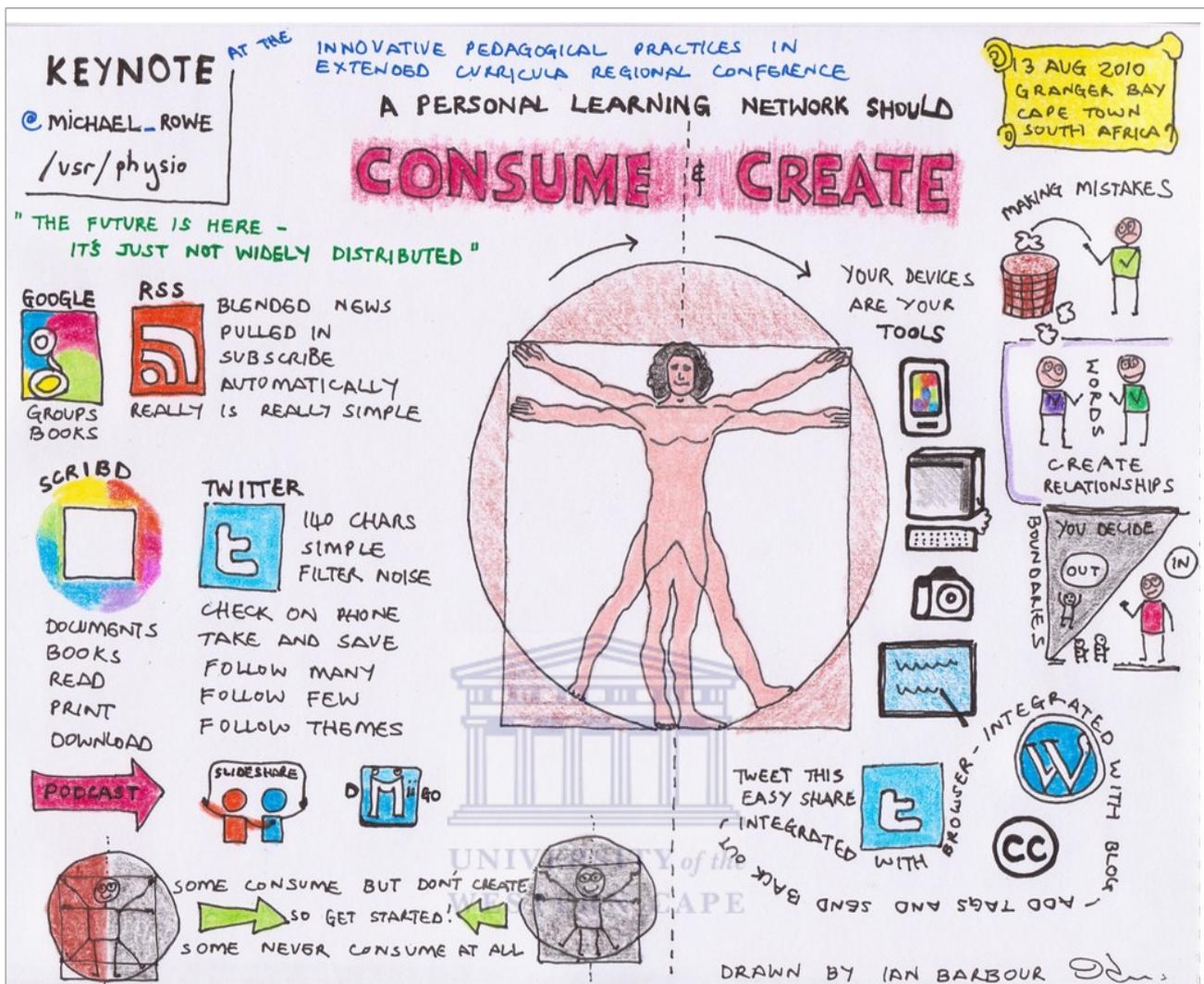


Illustration 10.1: A graphical summary of the presentation I gave at the "Innovative Pedagogical Practices in Extended Curricula Regional Conference" Programme, 12-13 August (2010), on the use of technology to create innovative learning spaces. Graphic by Ian Barbour, University of Cape Town.

In this chapter I describe how we used authentic learning as a framework to guide the implementation of a case-based learning module in an under-resourced South African physiotherapy department. Google Drive was used as a collaborative online authoring environment in which small groups of students were given authentic clinical problems and guided through the reasoning process by a team of facilitators. The clinical cases given to the students were collaboratively developed in near real time in the same online space, in

response to emergent student needs, demonstrating a flexible approach to course design. The next section will describe flexible teaching and learning practices using authentic learning as a guiding framework, and Google Drive as an implementation platform, and stands in stark contrast to the dominant use of technology in higher education. The aim of the chapter is to determine changes in students' learning practices after using a collaborative online environment to create an authentic learning space. The chapter answers the question: How can we use collaborative online environments to create an authentic learning space?

The next section of this chapter is under review with the British Journal of Educational Technology as:

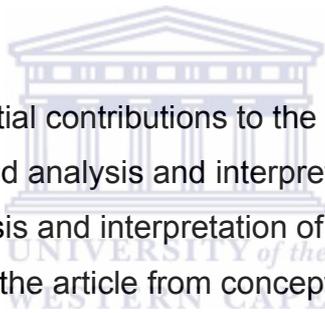
Rowe, M., Bozalek, V., & Frantz, J. (2012). Using Google Drive to facilitate a blended approach to authentic learning.

M.R. was responsible for substantial contributions to the conception and design of the project, the acquisition of data, and analysis and interpretation of the results.

V.B. and J.F. contributed to analysis and interpretation of results.

M.R. was responsible for drafting the article from conception to the final, submitted version.

V.B. and J.F. were responsible for the final approval of the version to be published, and for critical reading of the paper.



10.3. Using Google Drive to facilitate a blended approach to authentic learning

Abstract

While technology has the potential to create opportunities for transformative learning in higher education, it is often used to merely reinforce didactic teaching that aims to control access to expert knowledge. Instead, educators should consider using technology to enhance communication and provide richer, more meaningful platforms for the social construction of knowledge. By using technology to engage in shared learning experiences that extend beyond the walls of the classroom, we can create opportunities to develop the patterns of thinking that students need to participate in complex, real world situations.

We used authentic learning as a framework to guide the implementation of a case-based, blended learning module in a South African physiotherapy department. Google Drive was used as a collaborative online authoring environment in which small groups of students used clinical cases to create their own content, guided by a team of facilitators. This paper describes an innovative approach to clinical education using authentic learning as a guiding framework, and Google Drive as an implementation platform. We believe that this approach led to the transformation of student learning practices, altered power relationships in the classroom and facilitated the development of critical attitudes towards knowledge and authority.

a) Background

The standard of thinking within the confines and parameters of the textbook, is an obstacle in finding creative ways for solving problems

Student comment during this study

The past few decades have seen changes in our understanding of how learning happens, yet clinical educators still emphasise the transmission of content in their teaching practices (Graffam, 2007). While lectures are not inherently bad, information moves in one direction and students are rarely given opportunities to articulate their thinking. This means that any misconceptions they have are not shared, making it difficult for teachers to address errors in their understanding. This more traditional approach to learning, in which didactic methods predominate, assumes that knowledge is separate from context and regards it as a discrete “substance” that can be transferred between people (Seely-Brown & Duguid, 1989).

However, learning is a situated activity in which meaningful knowledge construction happens in the same context in which the knowledge will be used (Lave and Wenger, 1991), rather than something that moves between people. When knowledge and context are separated, knowledge is seen by learners as a *product* of learning, rather than a set of tools for solving problems in a *process* of learning (Herrington & Oliver, 2000). In physiotherapy education, students are introduced to the tools – ways of thinking and knowing – of the professional community, allowing them access to what it means to be a practising member (Lave & Wenger, 1991). It is this engagement with contextually relevant problems using the tools of the profession that enables the student to move from a legitimate peripheral participant to a practising member of the community.

Clinical educators must therefore focus on the process of learning, going beyond teaching students what to know and what to do (Fraser & Greenhalgh, 2001). We must instead help them learn how to think. One way to develop critical thinking is through inquiry-based learning, in which students explore questions that they generate themselves (Justice et al., 2007a). It requires an environment that supports open discussion, questioning assumptions, and the critical evaluation of information, reflection, evidence and argument.

Using principles of authentic learning, teachers can create environments reflect the context of the real world activity, encouraging students to think and behave as practising members of the community (Herrington & Oliver, 2000).

To help them navigate these learning environments, students need guidance in the form of a collaborative partnership to help them move from their current cognitive level to higher understanding. This social construction of knowledge is dependent on language and symbols as a means of communicating advanced ideas through structured dialogue (Vygotsky, 1978). Communication within a specific context is what enables students to make conceptual leaps, without which they would be unable to discern the tacit knowledge that is hidden from the novice (Laurillard, 2002). Communication and dialogue are therefore essential aspects of learning, as they provides the means by which students construct their own understanding of the world. By engaging in shared learning experiences that extend beyond the walls of the classroom, we can create opportunities to help students develop the tools they need to participate in complex, real world situations “in which coming to know is as important as knowing” (Cormier & Siemens, 2010, p. 38).

The emergence of digital technologies as an empowering medium for change in higher education has the potential to bring about transformative learning through enhanced communication, by providing richer and more meaningful platforms for the social construction of knowledge (Anderson, 2011; Veletsianos, 2011). However, the predominant use of technology in education has been to reinforce didactic teaching by improving the efficiency of content delivery (Wilson, Parrish & Veletsianos, 2008). We must therefore ask if the value of higher education is in carefully controlled access to expert knowledge, or in the engagement that arises through discussion (Cormier & Siemens, 2010). If educators believe that the purpose of higher education is to deliver content, then it follows that their use of technology will merely reinforce didactic teaching methods that have a limited impact on qualitative learning outcomes (Herrington et al., 2009).

Much of the research into educational technology emphasises its role in information transfer, rather than as a transformative medium that leads to improved learning through structured interaction. This paper describes the use of Google Drive to create a blended learning environment that facilitated interaction between students and teachers in online

and physical spaces, where students completed authentic tasks that aimed to develop critical thinking.

b) Method

Research setting and background

The study was conducted in 2012, in a physiotherapy department at the University of the Western Cape, South Africa. It was initiated when the department received feedback from external examiners who indicated that final year students displayed a lack of reasoning and critical thinking during their clinical exams. The second year Applied Physiotherapy module (hereafter referred to as *Applied*) was selected as an appropriate module in which to evaluate the use of a theoretically-informed, blended approach to teaching and learning. In *Applied*, students learn the pathology, clinical presentation, and therapeutic management of common health conditions found in the South African healthcare system. Previously, students were provided with course readers covering the major concepts for each condition, and a lecturer went through the course readers with the students, using a predominantly lecture-based format.

Consequently, several changes were made to the module, including a move from lectures to case-based learning, and the integration of technology to facilitate different forms of communication, both of which were informed by social constructivist and situated theories of learning. We moved from having one lecturer in the classroom, to having between eight and ten facilitators, and used clinical cases to promote critical thinking and problem-solving in small groups. We used Reeves, Herrington and Oliver's (2002) ten characteristics of authentic tasks as a framework to guide our implementation of case-based learning using Google Drive.

Google Drive is a free service from Google that includes word processing and presentation components, enabling multiple authors to work together in real time. It has version control, permissions-based sharing and instant messaging features that enhance the potential for collaboration. Students used Google Drive to collaboratively create notes in small groups both during and after classes, based on their exploration of the case. We used principles of authentic learning to design the cases and inform the teaching approach, which is briefly described below.

1. *Authentic activities have real world relevance, matching as nearly as possible the tasks of professionals in practice.* We used Google Drive to develop clinical cases, making regular adjustments based on student feedback and observations of activity in class and online. The cases were designed to encourage ways of thinking that would be expected in the real world management of patients. Using Google Drive enabled us to plan the teaching methods and modify variables at each stage of the case.

Introduction to section 1 of the case	Lecture	Clinical visit	Feedback in small groups
Introduction to the assignment	Practical	Reflective blog posts	Informal peer evaluation
Setting group norms	Review objectives for tomorrow's clinical visit		Finalise case notes for the week
Role allocation			Group presentation

Objectives section 1

Introduction to section 1

You have received a referral for Mr J. Mr J was shot thrice by an opposing gang in the right arm, left tibia/ fibula area and left chest area. Entrance and exit wounds were found for bullets in arm and left tibia/fibula. The bullet that entered the chest had no exit wound but entry wound was found left Axilla. He was brought into the emergency unit several hours after the shooting. Mr J now complains of numbness, weakness and burning sensation on right arm; weakness in right lower limb; only slight pain in left lower limb.

Section 2

A CT scan revealed that the bullet that entered in at the left axilla was lodged in T10-T11 foramen. An X-ray showed a ~~X-ray revealed haemopneumothorax on the left. X showed~~ comminuted fracture of tibia. The patient now complains of sharp chest pain, difficulty breathing. An operation was done to remove the bullet in the chest.

Section 3

Mr J received a phone call from his gang members informing him that the person who shot him is going to make a hit on his wife and three kids. The nurses file indicated that Mr J has had

Comments:

I got two pdf for stump care, I have shared it in the resource folder for case 6
Comment · Resolve

14:23 18 Sep

Selected text:
Lecture
I can email ask them to do a short lecture on amp/rehab/sci rehab?
Comment · Resolve

I saw your email, thanks. I have added in the case 6 folder a outline of the lecture presentation. We just need to say if we like to include everything as it is in the outline
10:02 19 Sep

14:22 18 Sep

Selected text:
Lecture?
Can do a short lecture here or on Tues?
Comment · Resolve

12:11 13 Sep · Re-open

Show changes
Show more detailed revisions

Illustration 10.2: Example of using Drive to collaboratively create a clinical case for students.

2. *Authentic activities are ill-defined and problems are open to multiple interpretations rather than easily solved by the application of existing algorithms.* The cases were complex, requiring students to find associations between variables that were not explicitly linked. They needed to derive their own research questions after identifying gaps in their knowledge and understanding, conduct the research and then create their own notes in Google Drive, summarising and synthesising the information they had found.

The screenshot shows a Google Drive document with a table of group norms, an introduction to a clinical case, and a comments sidebar. The table lists tasks for group members, including setting norms, reviewing objectives, and finalising case notes. The clinical case introduction describes a patient with a gunshot wound and a brick injury. The comments sidebar shows a discussion about a discharge and rehabilitation plan, with a 'Re-open' button and a 'Marked as resolved' status.

Setting group norms	compulsory (BS, DH)	group members
Role allocation - Students are responsible to keep attendance records of their group members	Review objectives for tomorrow's clinical visit	Informal peer evaluation
		Finalise case notes for the week
		Oral Test

Introduction to Case 6
The highest cause of injury for males in South Africa is homicide, which is the fourth leading cause of death overall, preceded only by communicable and non-communicable diseases (Bradshaw et al., 2004). See <http://www.mrc.ac.za/bod/estimatesresults.pdf> for more detail.

Section 1
You receive a referral for Mr J on day one post-admission. After reading his medical folder you obtain the following information: He was brought into the emergency unit several hours after being shot, accompanied by an armed police officer. He was shot twice in the right arm and once in right chest area. Entrance and exit wounds were found for the bullets in the arm; the bullet that entered the chest had no exit wound and entered at the right axilla. During the attack he was struck with heavy brick on his left lower leg and presents with massive bruising and swelling. His right upper arm is now swollen, and he complains of numbness, weakness and a burning sensation in that area. He also complains of weakness in the right lower limb and only slight pain in the left lower limb. His current vital signs are: T: 36.5 degrees; RR: 26; HR: 100; BP: 130/90. The doctor has stated that no mobilisation should be done.

Use the questions below as an overview for working on the 7 step process:
What do you know?
What do you think you know?
What do you need to find out?

Comments

What would your discharge and rehabilitation plan should we include this or rather remove it? I think we should remove it the facilitator should guide them in this direction
Comment · Resolve

Selected text: 14:22 18 Sep · Re-open ✓

Lecture
Or another slot for a lecture as they will not take that long with the 7 jump process??
Comment

Yep i think tuesday is a good option
10:01 19 Sep

Have not heard back yet... Will start working on something just incase we dont get a positive answer
10:40 19 Sep

Marked as resolved
09:05 20 Sep

Adding a comment will re-open this

Selected text: 10:05 19 Sep

Illustration 10.3: Example of the clinical case (i.e. complex task) that students received.



3. Authentic activities comprise complex tasks to be investigated by students over a sustained period of time. Each case ran over a three week period, with students meeting in class for face-to-face contact three times a week, and interaction on Google Drive was used to supplement the classroom discussions. The task (ie. clinical case) was not an isolated activity, with Google Drive being used both in class while students engaged in research and content creation, and afterwards when facilitators and peers gave feedback on the students' notes.

4. Authentic activities encourage students to examine the task from different theoretical and practical perspectives, using a variety of resources that require them to critically evaluate information. Facilitators reviewed students' case notes weekly, providing feedback using the comments feature, asking questions about missing information, unsubstantiated claims, and dubious sources. Students were able to respond within the comments, asking their own questions or clarifying their understanding. Other facilitators

joined in the conversation, sharing their own experiences and thoughts.

5. *Authentic activities require collaboration, which is integral to the task, so that success is dependent on it.* Case notes were developed collaboratively by the student groups, and all notes were available to all other groups, as well as to facilitators. Each week, students created summaries of their case using the slideshow component of Google Drive, presented this in class, and then shared the summary with everyone. Google Drive also features an instant messenger, which allowed students and staff to discuss aspects of the case notes while looking at the document together, from different locations.

The screenshot displays a Google Docs interface for a document titled "Case 5 - Group J". The document content includes an X-ray image of a wrist, a "Hypothesis" section, a "Signs and Symptoms" section, and a "Physiotherapy Management" section. A "Revision history" sidebar is open on the right, showing a list of edits with timestamps and user initials. The document text includes the following sections:

Hypothesis
We believe Tom has a GREENSTICK FRACTURE because the bones of a child are more pliable than the bones of an adult's, therefore the force that created the break only broke the outer part of the bone and caused the opposite side to bend. Usually, in an adult, the same amount of force would have broken the same bone completely, because their bones are not as pliable.

Signs and Symptoms
Symptoms of a broken wrist are severe pain and sometimes numbness of the forearm and hand. Signs include; any type of deformity to the wrist, elbow or forearm, tenderness, swelling and the inability to rotate (pronation and supination) the forearm.

Physiotherapy Management
Isometric-contractions: during the time when the patient is still in cast, to prevent muscle

The revision history sidebar shows the following entries:

- Aug 29, 06:48
- Aug 26, 19:44
- Aug 26, 16:57
- Aug 24, 13:12
- Aug 24, 12:25
- Aug 23, 06:56
- Aug 21, 14:04
- Aug 21, 07:24
- Aug 20, 20:15
- Aug 16, 21:04
- Aug 15, 12:51

Illustration 10.4: Example of a groups' set of notes, with the version history showing the students who had contributed during the case.

6. *Authentic activities provide the opportunity to reflect on learning, both individually and with others.* Feedback to students within their case notes was in the form of comments and questions, encouraging them to reflect on their assumptions and reasoning. They were challenged on their statements, and encouraged to articulate their understanding.

Questions were not asked to elicit information, but rather to stimulate further thinking.

Physiotherapy management

1. Muscle tone
2. Strengthening
3. Range of motion

Test Flexion and extension due to Toms flexion contraction at the knee hinge joint.

4. Stretching
5. Education on joint protection
6. Home exercise plan
7. Education on pain reducing techniques
8. Muscle relaxation techniques
9. Splints or orthotics maybe be beneficial to help maintain normal bone and joint growth/prevent deformities during growth

Physiotherapy Treatment according to Nalan, B. (2005)

Heat and cold therapy, massage, electrical stimulation, and ultrasound are the main modalities used to treat Juvenile arthritis. The aim for these treatments is to relieve pain and stiffness, reduce contractures in the muscles and train specific muscle groups.

1. Heat therapy
helps to decrease joint stiffness, increase flexibility of tendons, and decrease pain and muscle spasms.
2. Cold treatment
has an analgesic effect and vasoconstriction purposes in the inflamed joints during the acute period.
3. Massage
relieve pain and prevent adhesions in the subcutaneous tissues.
4. Electrical stimulation
used for children that have excessive muscle atrophy as well as children that cannot or does not exercise.

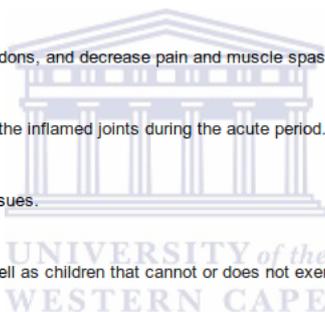


Illustration 10.5: Example of case notes with questions from facilitators, and a response from a student.

Resolve

12:28 24 Aug

It is important that you expand on the list. What muscle relaxation technique will you use? Where will you stretch and how are the stretches performed? What will the home exercise plan include? ETC

Reply to this comment...

11:45 14 Aug

Memorising this list will not help you with any patient you're likely to see. For each item, you must explain what it means in the context of this patient.

10:18 20 Aug

expand on specific muscles and joint movement affected

7. *Authentic activities can be integrated and applied across different subject areas and lead beyond domain-specific outcomes.* Each case was designed to integrate research, ethical reflection, legal aspects of healthcare, and knowledge from other modules eg. Anatomy. The case was designed so that it was not an isolated activity that was separate from other modules.

8. *Authentic activities are seamlessly integrated with assessment in a manner that reflects real world assessment.* Formative assessment was an inherent part of the activity, with peers and facilitators regularly challenging statements and assumptions that arose during the classroom sessions, and in the online notes. Students and facilitators used comments in Google Drive to ask questions regularly.

9. *Authentic activities create polished products valuable in their own right rather than as preparation for something else.* The notes that were created by the students in Google Drive constituted their content for the module, making them an important product of the task. The questions for the tests at the end of each term were derived from both the students' notes and the facilitators' guides, which meant that the student-created notes had real value for them.

HEALTH CONDITION:	IMPAIRMENTS:	ACTIVITY LIMITATION:	PARTICIPATION RESTRICTION:
C Y S T I C B R O N C H I T I S	Lung infection	Cycling, Walking, Swimming, Camping ADL's, walking, running	Going camping with family, cycling with husband and swimming with friends
	Sputum retention (respiratory distress)	Cycling, Walking, Swimming, Camping	Socializing with friends going camping with family, swimming with friends, cycling with husband, performing ADL's
	Impaired lung volume (decreased endurance, Chest expansion & shortness of	Exercising, walking, swimming, cycling, running, climbing stairs	Going camping with family, cycling with husband and swimming with friends

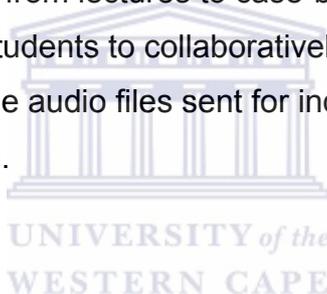
Illustration 10.6: Example of a weekly summary by one group, that was shared with other groups. These summaries represented a completed “product” of a week’s work, and was used to guide students’ learning.

10. *Authentic activities allow multiple solutions and diversity of outcome, rather than having a single correct response obtained by the application of rules and procedures.* Each groups' online case notes were different, reflecting the questions they answered after exploring their own understanding of the case. While facilitators ensured that the major concepts were addressed, students could take their own routes to achieving the objectives.

Data collection

Focus groups were held at the end of the first semester in 2012, including the researcher and two groups of six students. This method was chosen because it encourages the creation of meaning through sharing ideas that individuals may not have thought of independently (Babbie and Mouton, 2006). The researcher asked all 61 students in the second year class if they were prepared to participate in a focus group, and 22 responded positively. Twelve students were invited to participate, selected from both high and low ends of scales that measured their age, levels of online participation and their average marks in the module, in order to include as diverse a sample as possible.

Each session began with an explanation of the purpose and procedure of the discussion. Participants were asked to discuss the following topics, which were based on the major changes in the module: the move from lectures to case-based learning in small groups, and the use of Google Drive for students to collaboratively develop content. The discussions were recorded and the audio files sent for independent transcription, and then sent to participants for verification.



Data analysis

The transcripts were analysed inductively to determine themes that emerged from participant responses (Elo and Kyngäs, 2008). Inductive analysis was chosen as there is no evidence of any previous studies that evaluated the use of Google Drive to work collaboratively with the aim of developing critical thinking in any domain of healthcare education. Words and phrases with similar meanings were identified, coded and then organised into categories that best represented the emergent themes. The themes were analysed and discussed by the author and a co-author, and then independently reviewed by the third co-author, in order to reduce the potential for bias (Pope, Ziebland and Mays, 2000).

Ethical considerations

The study received ethical clearance from the University of the Western Cape Ethics Committee (project registration number: 09/8/16). Students volunteered to participate and were informed that there would be no negative consequences if they chose not to. All

participants could withdraw at any time, including after the focus groups had taken place. Participants were informed that while participant anonymity was required, they could discuss the content of the focus group with others. Transcripts were anonymised on return from the transcriber, prior to being sent to participants.

c) Results and discussion

Responses are presented in support of the major themes that emerged during the content. These themes include changes in student perceptions of their roles in the learning process, personal empowerment through self-directed learning, changing of power, and the development of critical thinking.

Student perceptions around learning

While they were initially resistant to the approach, the following responses highlight how the students underwent a transformation in how they thought about their role in learning, as well as a changing perception of what learning is.

When this new approach came it changed the whole thing. It forced me to understand why would I do this, instead of that. So it changes that perception that you can memorise your way through a degree.

My learning has changed. If I do the research, if I read the notes on Google Drive and if I go through it every day, I feel that I retained that information. When I come to write [tests], it just comes - like it's a part of me.

Being a student used to be like a job. So with this job I come to varsity from eight and knock-out at two and that's it, nothing to do with learning. Now it broke that fine line and redefined what learning was, it's not a classroom thing; it's a daily thing.

It's not just learning from a book, it's...it's trying to find out how to learn.

These responses demonstrate that while we provided the opportunity for transformation, it was the students who took advantage of the opportunities (Veletsianos, 2011). The use of authentic learning to develop cases that we implemented in Google Drive enabled us to

help change how students perceive their own role in the learning process. As part of this process, students had to create their own research questions after identifying gaps in their understanding, through discussion with peers and facilitators. Rather than being given content and told what to learn, the process required them to evaluate their own needs and respond appropriately, thereby empowering students to take control of their learning. The following responses demonstrate how students perceived the inquiry-based component of the cases, and the development of critical thinking as part of an approach to lifelong learning.

I thought it was really effective that we have to explain to our peers what we have researched. So we have to have a good understanding of what we've found and not just copy-and-paste into our documents, but really be able to explain to other people so that they can understand.

I had to learn new ways of researching and how to find relevant and concrete information online, and to be selective of what information to choose.

So I found some good stuff the other night, but then I checked the date and I was like, that's older than me, I can't use that.

Using Google Drive afforded students a platform to develop the processes and skills they needed for the independent exploration of concepts and facts (Justice et al., 2009). This critical interaction with information helped them to move towards autonomous learning, empowering them to control where, what and how they learn. Specific features of Google Drive facilitated this process, including the "public" nature of the notes, which encouraged regular feedback from peers and facilitators, instant messaging that allowed students to chat with each other in the document window, and email notifications when changes or comments were made.

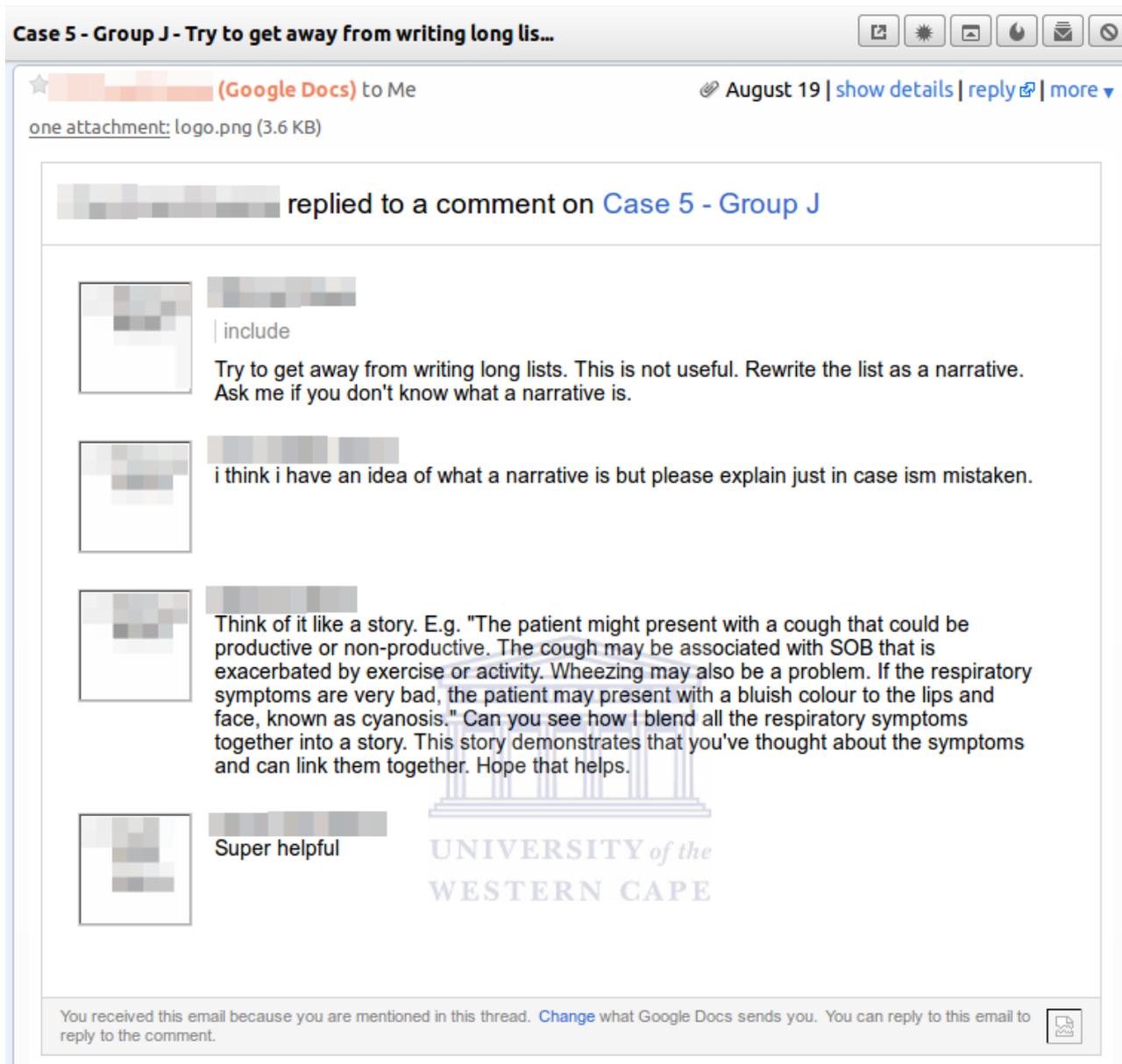


Illustration 10.7: Example of the email containing a conversation between the researcher and two students.

Changing power relationships as part of learning

We used interaction in the online and physical space to intentionally change power relationships between teachers and students, guided by principles of authentic learning. The following responses highlight how students perceived these changing relationships.

I found that we've all got something to learn from each other. Even a lecturer has something to learn from a student...I think it has a lot to do with the

interaction with facilitators. I've never had a problem with asking questions, but I still always felt like I'm going to look like an idiot if everyone knows this and I don't. I never feel like that any more...you're not going to think I'm an idiot.

I come from a background where we are taught protocol – this is your teacher, address him as 'Sir'. Now, coming with the type of relationship we have [in Applied] – that level of “superiority” has been reduced. And having [you] interested in things that I know, it's nice to discover that, hey, I also know something - I have something to say.

I like the way the teaching happens now, it broadens our minds, our ways of thinking. Like, okay, we didn't see that part, or, yes, we can think that way. You open your mind to a whole new world, a new way of thinking.

Power relationships are well-established in medical education, with teachers often using their power to “motivate” students with fear and shame (Jarvis-Selinger, Pratt and Regehr, 2012). By intentionally changing these relationships we created a safe space, where both students and facilitators could normalise “not knowing” the answer. By liberating students from the necessity of being “right”, they could explore their own understanding without fear of being exposed and shamed (Ovens, Wells, Wallis & Hawkins, 2011). The changing power relationship and reduction of authority can play a role in changing students' beliefs about who controls their learning, with an open environment helping them take on that responsibility (Bergström, 2010). This movement of authority away from the facilitators led to the development of personal empowerment among the students, enabling them to direct their own learning.

Development of critical thinking

We believe that this approach enabled students to change how they think about learning, relationships and content, in ways that led to critical thinking. The responses below demonstrate evidence of critical thinking around content, the profession and their teachers.

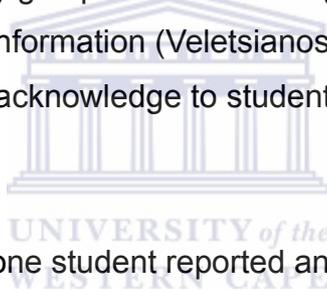
We're more confident in challenging ourselves. We're not just going to accept things. We're going to challenge ourselves and think further because we don't

just want to know the basics. We want the knowledge to go further than what we see.

I believe that as a physio, you have to ask “Why?”, every time you see something. Applied has changed our mindset. Every time we face a challenge, every time we see something...Why is this happening? Why is it happening this way?

It allowed me to scrutinise what my lecturers teach me. It opened that door – they’re not always right, they don’t know everything.

If teaching is about “moving minds” to develop independent thinkers who will not bend to the will of teachers (Laurillard, 2012, p. 5), it is clear that these students did not simply accept the voice of authority. They grasped that knowledge is distributed and that the teacher is not the sole source of information (Veletsianos, 2011). Whether teachers are willing to give up this control and acknowledge to students that they may also be wrong will be a challenge to many.



In addition to the themes above, one student reported an undermining of the process by a colleague in the department, who was not involved in this module.

Some people in the department are bashing [this module]. They say we don’t know enough, but we’re second years, we’re not supposed to know everything. And when people are saying we’re never going to get there because of the way this module’s happening, that annoys me because I don’t see it like that. We don’t see the plan – these people [the other lecturers] probably don’t see the plan either, we know they don’t. We were told that we were going to fail before we even started – we were told it’s not going to work. She didn’t say she doesn’t *think* it’s going to work – she told us it’s *not* going to work.

This demonstrates that this student took a critical stance and disagreed with the lecturer's point of view. She challenged their authority, positioning herself as a novice learner, and was confident of where she is at this stage of her education. Attempts to modify teaching

practices may have far reaching consequences for other lecturers, and should be approached with the understanding that they may resist the process. These curricular changes, while clearly beneficial for students, were nonetheless undermined by colleagues, suggesting that innovative approaches to teaching and learning may need institutional support in order to drive the process (Bozalek and Dison, 2012).

d) Limitations

One of the limitations of this paper is that it only describes the focus groups that were held at the end of the first semester, meaning that these outcomes represent one snapshot of the process at a relatively early stage. Another set of focus groups (with the same students) was held at the end of the first term, yielding different results than those presented here. Taking this into account, it is evident that students' perceptions of the process are changing over time. It would also be useful to conduct another set of focus groups at the end of the first year, which would enable the tracking of change over time. This might have served to describe a more complete and accurate picture of the process, rather than only a single snapshot.



e) Conclusion

We used Google Drive as a collaborative authoring platform to implement authentic learning tasks in the form of clinical cases, and used features of the online service to encourage interaction and discussion in order to develop critical thinking in a clinical context. We demonstrated that students' ways of thinking and of being had changed during the course of the module, facilitating a process of transformation around learning. This transformation was evident in their changing perceptions of their own role in the learning process, a movement of power away from teachers as students took control of their learning, and the emergence of critical attitudes towards knowledge and authority. If clinical educators aim to develop critical thinking within their students, they should consider the use of authentic activities that are integrated across physical and online spaces, using appropriate technology platforms that are informed by sound theoretical perspectives.

10.4. Conclusion

Chapter Ten presented the results of a study that aimed to evaluate the qualitative learning outcomes of a blended learning module that aimed to develop capability in undergraduate physiotherapy students. Certain major aspects of the blended learning module were described, informed by design principles that had been developed throughout this research project. The learning tasks were presented, based on a model of authentic learning, and implemented using Google Drive as a technology platform. Evidence was provided that supports the use of Google Drive as a platform in which to operationalise authentic activities in an online space.

The major findings of the chapter were that students' perceptions of teaching and learning had changed as a result of the approaches used in the module. They acknowledged their own roles in learning, as well as showed evidence of a critical view of content, the profession, and authority figures in the course. It was clear that the power relationships in the module had changed, with students taking more responsibility for learning, and were moving towards independent thinking and self-directed learning. This move towards *thinking about learning* is significant in that it represents a departure from traditional conceptions of learning, where students simply get on with it, without putting much thought into what exactly it means to learn (Ovens, Wells, Wallis & Hawkins, 2011).

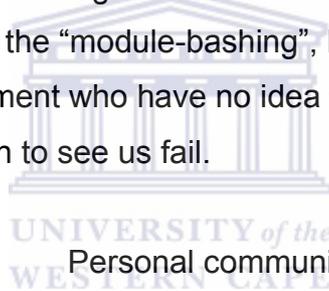
Of concern was the active resistance to the blended learning module from colleagues who were not even involved with the module. While I was prepared to defend any design choices made as part of the approach to teaching, I had not considered that a colleague would go to such lengths to sabotage the project. The evidence presented in the previous section forms only part of the informal feedback I received that demonstrated the extent of the resistance we experienced from colleagues. The reflection below was recorded in my private journal following a conversation between two colleagues at the department planning meeting in September 2012, and is presented here to support the idea that no matter how good your design choices are, you will find yourself in situations that you never expected to encounter.

[A colleague] came to see me today and told me that [another member of staff]

had made a passing comment to her that we were doing our students a disservice by withholding content from them. She said that we were disadvantaging the next generation of physiotherapists with the way that we're running Applied.

I felt angry and betrayed, because the truth of the matter is that we're putting more time, thought and effort into this module than anyone has ever done before. The irony is that we have more evidence supporting our choices than [she] has for any of her lectures.

I'm angry because she hasn't raised her concerns in any way that I can actually address. I can't defend our choices because she hasn't come out and said anything to me. It's a sneaky, underhanded way to sabotage the module, and what can I do about it? I thought that this was all behind us after the first time the students' reported the "module-bashing", but it's clear that there are some people in the department who have no idea what we're doing, and yet they'll do whatever they can to see us fail.



Personal communication (05 September, 2012)

From the conversation reported to me, it was clear that certain people in our department had made poorly informed assumptions in their understanding of what inquiry-based and authentic learning means, leading them to reject the idea without discussing it. If colleagues perceive that inquiry focuses more on skills than discipline-specific content, they may argue that the approach "undermines students' education" (Justice, Rice, Roy, Hudspith & Jenkins, 2009), which is exactly what we experienced. If clinical educators are considering this kind of teaching approach, they should prepare arguments in support of their choices.

Arguments for the use of inquiry-based approaches are that they are in fact similar to what academics do themselves in their own research. While it is true that inquiry can take up some of the limited time available in the curriculum, the skills learned during this process lead to students' being better able to work as autonomous professionals

(Justice, Rice, Roy, Hudspith & Jenkins, 2009). In addition, opponents can be challenged on what they themselves can remember of the detailed, discipline-specific content from their own studies. Finally, proponents of inquiry should ensure that support of the “new” approach is not at the expense of the “old”. It should be noted that there is little widespread sense of ownership in inquiry-based courses. Therefore, it may be useful to engage senior students in the process, as well as staff who are interested in the idea and who are prepared to defend it (Justice, Rice, Roy, Hudspith & Jenkins, 2009).

Following the outcomes of the first evaluation conducted halfway through the first iteration of the blended learning module, the draft design principles were revisited, leading to minor changes and refinement. These changes are presented below in Table 10.1.

Table 10.1: Final set of design principles, following this component of the study.

Developing capability in physiotherapy students may best be facilitated by learning designs which:	
Facilitates interaction between people and content	<p>The concept of a single lecturer or teacher was replaced with multiple facilitators, each of whom could present a different perspective to students, modelling different ways of thinking and being.</p> <p>Some facilitators gave students work and personal email addresses, and cellphone numbers (for SMS, Blackberry messaging and WhatsApp). Students would contact facilitators after hours, asking questions, explaining non-attendance, and many other short interactions that many educators might find intrusive. If learning can happen at any time, should students be able to ask questions at any time?</p>
Requires the articulation of understanding	
Builds relationships	<p>Building a relationship with students didn't only happen in the classroom. Several students came to facilitators with personal and social problems, often not looking for any sort of solution, but just needing to share what they were going through. Facilitators need to be available for students to talk to</p>

	<p>about whatever they need to.</p> <p>Talking about student-centred learning means actually being willing to give up power. When students didn't show up for class, the initial reaction was to want to "punish them". However, promoting the idea of student-centred learning means very little if facilitators display absolute power over students when their behaviour deviates from what is desired.</p>
Embraces complexity	
Encourages creativity	Principles of inquiry-based learning were incorporated into process, providing a more structured framework for students' development of their own content.
Stimulates reflection	Students resisted reflecting, particularly when they were asked to reflect on their emotional response to patient encounters. Resistance to reflecting only faded when students began perceiving that it had value for them. Until then, it was just something they had to do.
Acknowledges emotion	Facilitators' emotional responses to the module were initially not considered. It emerged that emotion was not just an aspect of clinical practice that needed consideration, but also emotion as part of teaching and learning.
Are flexible	
Are immersive	

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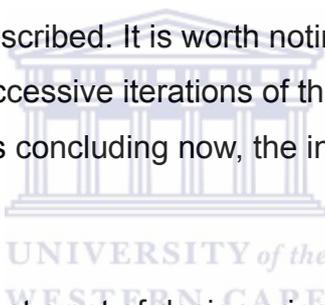
11. Chapter Eleven: Conclusions, limitations and recommendations

*I may not have gone where I intended to go,
but I think I have ended up where I intended to be*

Douglas Adams

11.1. Introduction

Chapter Ten marked the end of the third phase of the design research process, in which the intervention was designed, implemented and evaluated. This process led to the development of a set of design principles that are applicable for clinical educators who are interested in developing capability in undergraduate physiotherapy students. Chapter Eleven presents the conclusion of the study, in which the beginning of the fourth phase of the design research process is described. It is worth noting that the fourth phase of the design research process sees successive iterations of the intervention over a period of several years. While this project is concluding now, the intervention and subsequent evaluation will continue.



The aim of this chapter is to present a set of design principles that can be used as part of an approach to curriculum development that aims to improve capability in undergraduate physiotherapy students. It answers the question: What are the principles that clinical educators can use to design learning environments that aim to develop capability in physiotherapy students? In the following section, each aspect of the project phases is presented as a summary of the study that was done, highlighting its contribution to the development of the final set of design principles. To begin, an overview of the research project is presented below in Illustration 11.1.

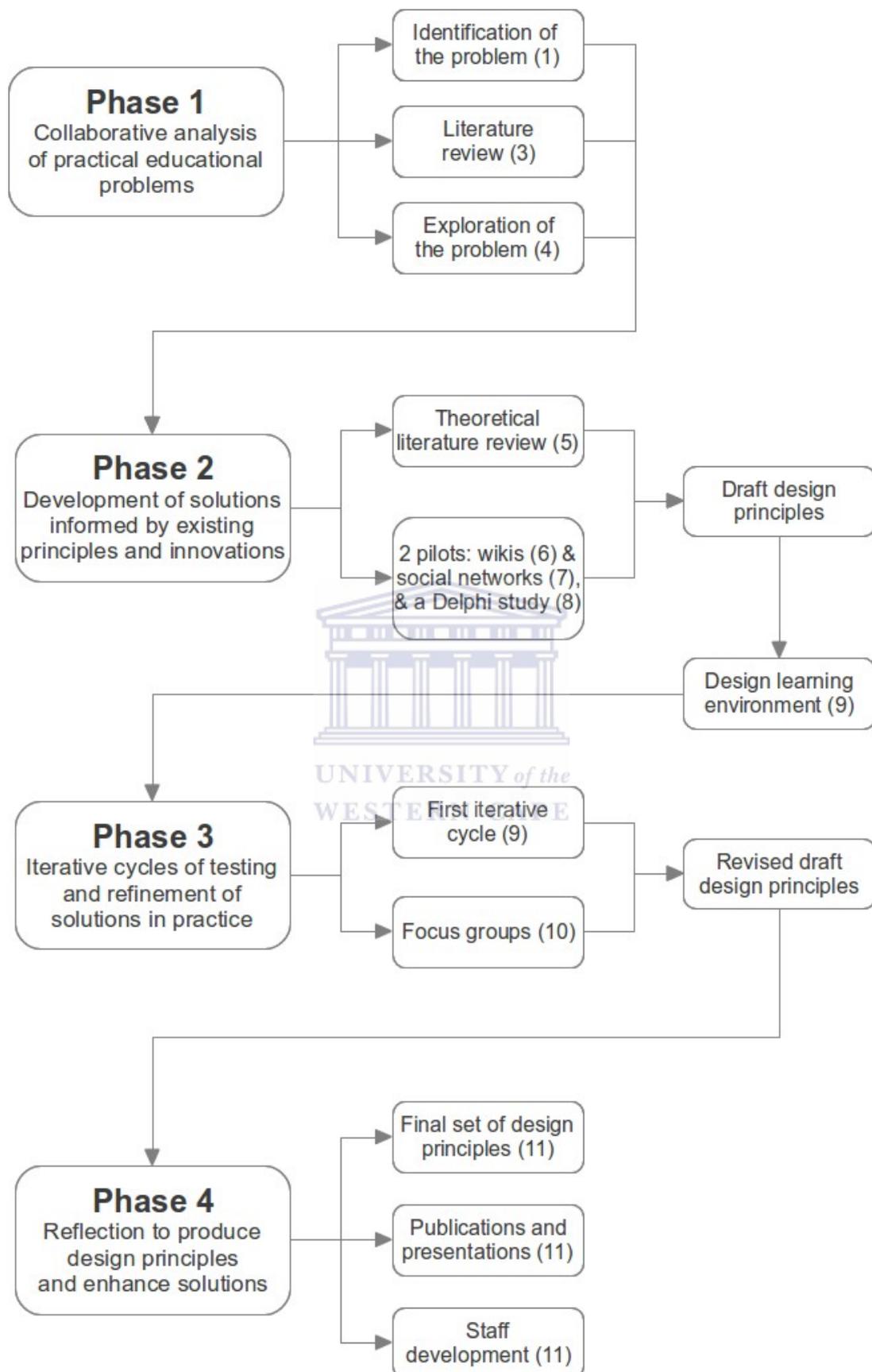


Illustration 11.1: Overview of the project, highlighting the phases and aspects of the study.

11.2. Contributions to the design principles

The conclusions of each of the chapters in this thesis describe major outcomes of smaller research studies that aimed to inform the development of design principles. Each of those studies is presented here, with the main aim of each chapter, as well as the outcomes that were incorporated into the design principles.

The first phase of the project analysed the practical and theoretical problems inherent in clinical and higher education. Chapter One described the problem that the study aimed to address, using a narrative review of the literature to highlight that clinical practice is complex, requiring a range of attributes that go beyond the simple competencies that are often emphasised in traditional approaches to clinical education. In order to adequately prepare physiotherapy graduates for the challenges of practising in complex health systems, clinical educators need to redesign their teaching strategies and move away from simplistic representations of the clinical context. In addition, while learning experiences in hospitals and other clinical environments are an essential aspect of undergraduate education, it is clear that they are challenging spaces in which to create opportunities for learning.

One of the ways in which some of these challenges can be addressed is through the intentional use of technology to change teaching and learning practices. Integrated with sound pedagogy, emerging technologies have the potential to create environments that present students with a multitude of opportunities for learning. These learning environments, in which physical and online spaces are truly integrated, provide a context in which the *process* of learning can be emphasised. However, the predominant use of technology in higher education has been to reinforce traditional structures and approaches to education, in which universities are perceived as content delivery mechanisms that negate the need for thinking and engaging with high-level concepts. But, when technology is used appropriately, it can create powerful and enhanced learning environments that lead students towards self-directed and autonomous learning practices.

After identifying the problems inherent in clinical education in Chapter One, Chapter Two highlighted several overarching research methods that were used in the study, as well as the studies that informed smaller aspects of the overall research project. This chapter on

research methods was presented before the literature review, which may be regarded as unconventional. However, this was intentional as it was presented to better inform the reader of the design research process. Specifically, this research project used two preliminary studies (i.e. a systematic review and survey of stakeholders) to partially describe the problems and challenges associated with blended learning in clinical education. The overall research methods therefore needed to be presented to the reader before those studies could be included as part of the initial problem description.

Chapter Two began by positioning the curriculum as a complex system, in which outcomes cannot be predicted or controlled because of the large numbers of interacting, dynamic variables. This was done to support the idea that the research methods used needed to be capable of accepting the disorder in the system, and rather than trying to control it, be flexible enough to respond to it. Three research methods informed the study, each one providing input that helped guide the research process. Action research was discussed as a way of assisting me to develop an initial structure for the project, as well as guiding a personal process of inquiry that served to help me better understand how I influenced the research, and was in turn influenced by it. Developmental evaluation was explored as a possible framework for evaluating complex systems in the sense that it does not aim to control and predict, but rather looks at evaluation as a process of development that iteratively improves the system as it unfolds. While development evaluation provided valuable insight into conducting research in complex environments, I decided that it lacked a focus on pedagogy that was required to produce a robust theoretical model. Finally, design research was presented as a method that could be used to develop principles for implementing an innovative intervention in an educational context.

Chapter Three explored some of the ways in which blended learning interventions aimed to develop clinical competencies in healthcare students, using a systematic review of the literature. This determined that blended learning has some potential to bring about changes in the qualitative outcomes of clinical education, including improvements in reflection, clinical reasoning, and bridging the gap between theory and practice. However, the body of evidence was limited and the technology used as part of the blended approach was often not integrated into the teaching and learning process, but rather as a standalone aspect of the module. It also demonstrated that any curriculum reform that includes

technology is context-dependent, and that the integration of technology needs to be aimed at addressing specific issues within a specific curriculum.

Chapter Four presented the results of a study that aimed to establish the local context for the research project. A survey was conducted within the undergraduate physiotherapy department which was part of the study, to determine students' experiences with, and attitudes towards the use of technology as part of their learning practices. The major outcome of this study was that these students lacked an understanding of how to integrate technology into their learning, and that significant training and support would be necessary if this were to be included in the curriculum. The first phase of the project was concluded at the end of Chapter Four.

The second phase of the project explored the development of an intervention that aimed to address the problem, by describing solutions that were informed by existing principles and innovations. This was completed by conducting a narrative review of relevant theoretical frameworks, two pilot studies that implemented different aspects of blended learning, and a Delphi study among three expert panels. These aspects of the second phase of the project were used to derive the first set of draft design principles that would be used to inform the creation of an intervention that aimed to develop capability in undergraduate physiotherapy students.

Chapter Five presented the first aspect of the second phase, exploring relevant theories of learning and technology-aware frameworks for teaching that could be used to inform a blended approach to clinical education. The major finding of this literature review were that there were a range of appropriate learning theories and teaching frameworks that clinical educators could use to effectively design blended learning modules in clinical education. These theories take into account social contributions to the personal construction of knowledge, and position technology as one way in which to enhance learning through new forms of communication. Relationships between people, objects, devices and networks were presented as a different lens through which to view knowledge creation, storage and distribution. Finally, authentic learning was identified as an approach to teaching that can be used by clinical educators to create learning activities that more accurately reflect the dynamic and complex healthcare environments in which physiotherapy graduates must

practice. The first set of draft design principles was informed by the results of this review of relevant theoretical framework, and presented in the conclusion of Chapter Five.

Chapter Six includes the first of two pilot studies that evaluated different aspects of a blended approach. This chapter presented the results of a survey conducted after students used a wiki to collaboratively create their own learning materials as part of an assignment. While they were able to produce the content, the study highlighted problems with collaborative groupwork, which hindered the process more than the technology. Students reported challenges while working in groups, negating the affordances of the wiki for collaborative work. However, while the challenges were significant, other outcomes included positive responses towards peer review and feedback, as well as working in public. The researcher also gained valuable experience in setting up and running an assignment that was conducted online, yet integrated with the classroom experiences of students.

Chapter Seven presented the results of a study that evaluated students' use of a social network to develop reflective reasoning around clinical experiences. Assisted performance was used as a teaching framework to guide the process of developing reflective skills in the online space. Students' sharing of personal experiences in the clinical context, together with interactions around these experiences, demonstrated that the use of technology to facilitate different forms of interaction can lead to the development of reflective approaches to clinical practice.

Chapter Eight presented the results of a Delphi study that used three expert panels to explore alternative methods of teaching and learning practices in the clinical context. The first panel described the desirable attributes of capable healthcare professionals in terms of a state of *being*, rather than of *having* knowledge and skills. In the second round of the study, clinical educators suggested a range of teaching strategies that aimed to develop more complex outcomes than simply *knowing* or *doing*. The developmental nature of learning was emphasised, with feedback and formative assessment being advocated as an integral part of the process. Integrating teaching and learning practices highlighted the connection and interaction between people in a process that valued human relationships. The panel also suggested that professional development should include students'

emotional responses and personal values as part of the curriculum. The third panel suggested that technology could be used as a way of changing communication between teachers and students, as well as changing how and when students interact with content. Technology could also be used to create flexible, reflective and collaborative learning spaces that lead to deep and meaningful understanding. However, they also emphasised that pedagogy must drive the use of technology, rather than using it for its own sake.

Chapter Eight marked the end of the second phase of the design research process. The research projects that were presented in Chapters Six to Eight resulted in outcomes that contributed to further refinement and development of the draft design principles initially presented at the end of Chapter Five.

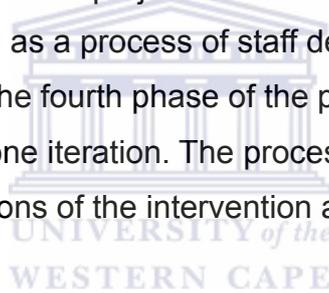
The third phase of the project described the development and implementation of the intervention, based on the draft principles developed in the second phase. Chapter Nine marked the beginning of the third phase of the design research process. In this phase, the final set of draft design principles were presented. These principles served to guide the design and implementation of a blended learning module that aimed to develop capability among undergraduate physiotherapy students. The learning environment was described, as well as how each design principle was implemented in the online and physical spaces. Examples were given showing how the module changed during its implementation as a result of both formal and informal student and staff interactions and feedback.

Chapter Ten presents the results of an evaluation of the blended learning module halfway through its first iteration. One aspect of the online learning space was described, as well as how the technology platform was used to implement authentic learning. The results of this evaluation show that students had undergone a transformation in how they think about, and practice, learning. They did not describe content as something to be passively absorbed, but as something to interact and engage with as part of a self-directed approach to learning. The results also highlighted a change in power relationships in the classroom, with students taking more responsibility as they acknowledged their own role in the learning process. Evidence of critical thinking is presented, as participants described changes in how they thought about their profession, as well as authority figures. Finally, evidence of an attempt to undermine the process by a colleague demonstrates that

innovations in teaching and learning practices may be resisted by other members of staff. This chapter demonstrated a process of transformation following the implementation of the design principles across physical and online spaces, highlighting that blended learning can have an important role to play in clinical education.

The conclusion of Chapter Ten marked the end of the third phase of the design research process. This represented the conclusion of the first of several iterative cycles of this blended intervention, which led to the refinement of the design principles based on an evaluation of the module.

The beginning of the fourth phase of the design research process is presented here in Chapter Eleven, as the conclusion of this study. This chapter presents the completed set of design principles that serves as one aspect of the total “output” of the study. In addition to these design principles, the research project led to a series of publications and conference presentations, as well as a process of staff development. Since design research is an iterative process, the fourth phase of the project is described here only briefly, as it has undergone only one iteration. The process of refining the design principles will continue as successive iterations of the intervention are implemented in the future.



11.3. Final set of design principles

Table 11.1 (below) is presented here as a major outcome and conclusion of this research project. The detailed descriptions of the principles have been summarised as a set “facets” of the principle i.e. different aspects of the principle that may help educators to design learning spaces that are relevant for their context. These design principles should be considered by physiotherapy educators who aim to develop in their students a range of attributes that may lead to capable practice. Successful implementation of these principles requires the intentional and appropriate use of technology as a means of changing teaching and learning relationships. This is similar to a recent result by Bozalek et al., (2012), who found that the use of technology was closely correlated with levels of authenticity. The relationship between the two was described more as a symbiosis than one of cause and effect.

This set of principles is presented with the top-level principles in the left column, and the facets of the principle in the right column.

Table 11.1: Final set of design principles for clinical educators who aim to develop capable physiotherapy students.

<i>Design principle</i>	<i>Facets of the principle</i>
1. Facilitate interaction	<ul style="list-style-type: none"> • Interaction can be between people and content • Communication is iterative and aims to improve understanding through structured dialogue conducted over time • Digital content is not inert, and can transform interactions by responding and changing over time • Content is a framework around which a process of interaction can take place – it is a means to an end, not an end in itself • When content is distributed over networks, the “learning environment” becomes all possible spaces where learning happens • Interaction is possible in a range of contexts, and not exclusively during scheduled times
2. Require articulation	<ul style="list-style-type: none"> • Articulation gives form and substance to abstract ideas, thereby exposing understanding • Articulation is about committing to a statement based on personal experience, that is supported by evidence • Articulation is public, making students accountable for what they believe • Articulation allow students' thinking to be challenged or reinforced • Incomplete understanding is not a point of failure, but a normal part of moving towards understanding
3. Build relationships	<ul style="list-style-type: none"> • Knowledge can be developed through the interaction between people, content and objects, through networks • Relationships can be built around collaborative activity where the responsibility for learning is shared • Facilitators are part of the process, and students are partners in teaching and learning • Facilitators are not gatekeepers – they are locksmiths • Create a safe space where “not knowing” is as important as “knowing” • Teaching and learning is a dynamic, symbiotic relationship between people • Building relationships takes into account both personal

	<p>and professional development</p> <ul style="list-style-type: none"> • Building relationships means balancing out power so that students also have a say in when and how learning happens
4. Embrace complexity	<ul style="list-style-type: none"> • Develop learning spaces that are more, not less, complex • Change variables within the learning space, to replicate the dynamic context of the real world • Create problems that have poorly defined boundaries that defy simple solutions
5. Encourage creativity	<ul style="list-style-type: none"> • Students must identify gaps in their own understanding, and engage in a process of knowledge creation to fill those gaps • These products of learning are created through an iterative activity that includes interaction through discussion and feedback • Learning materials created should be shared with others throughout the process, to enable interaction around both process and product • Processes of content development should be structured according to the ability of the students
6. Stimulate reflection	<ul style="list-style-type: none"> • Learning activities should have reflection built in • Completing the reflection should have a real consequence for the student • Reflection should be modelled for students • Reflections should be shared with others • Feedback on reflections should be provided as soon after the experience as possible • Students need to determine the value of reflection for themselves, it cannot be told to them
7. Acknowledge emotion	<ul style="list-style-type: none"> • Create a safe, non-judgemental space for students to share their personal experiences and thoughts, as well as their emotional responses to those experiences • Facilitators should validate students' emotional responses • These shared experiences can inform valuable teaching moments • Facilitators are encouraged to share personal values and their own emotional responses to clinical encounters, normalising and scaffolding the process • Sensitive topics should be covered in face-to-face sessions • Facilitators' emotional responses to teaching and learning should be acknowledged, as well their emotional responses to the clinical context

8. Flexibility	<ul style="list-style-type: none"> • The learning environment should be flexible enough to adapt to the changing needs of students, but structured enough to scaffold their progress • The components of the curriculum (i.e. the teaching strategies, assessment tasks and content) should be flexible and should change when necessary • Facilitators should be flexible, changing their schedules and approaches when in the best interests of the students' learning
9. Immersion	<ul style="list-style-type: none"> • Tasks and activities should be “cognitively real”, enabling students to immerse themselves to the extent that they think and behave as they would be expected to in the real world • Tasks and activities should use the “tools” of the profession to expose students to the culture of the profession • Technology should be transparent, adding to, and not distracting from the immersive experience

Table 11.1 has presented the final set of design principles that clinical educators should consider to inform the creation of learning spaces that aim to develop capability. Each principle includes a set of facets that provide further context. It is noted that even though these principles are presented here as an output, they are still very much a work in progress. Additional research will be conducted over the next few years, aiming to further refine and develop these principles and facets.

11.4. Publications and presentations

In addition to the design principles presented above, this project has also resulted in the following articles and conference presentations.

Published articles

Rowe, M., Frantz, J. & Bozalek, V. (2012). The role of blended learning in clinical education: a systematic review. *Medical Teacher*, 34(4):e216-e221.

Rowe, M., Frantz, J. & Bozalek, V. (2012). Physiotherapy students' use of emerging online technology as part of their learning practices. *South African Journal of Physiotherapy*, 68(1):29-34.

Rowe, M. (2012). The use of a wiki to facilitate collaborative learning in a South African physiotherapy department. *South African Journal of Physiotherapy*, 68(2):11-16.

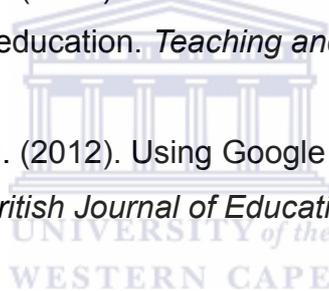
Rowe, M. (2012). The use of assisted performance within a social network to develop reflective reasoning in undergraduate physiotherapy students. *Medical Teacher*, 34(7):e469-75.

Articles submitted and under review

Rowe, M., Frantz, J. & Bozalek, V. (2012). Beyond knowledge and skills: The use of a Delphi study to develop a technology-mediated teaching strategy. *BMC Medical Education*.

Rowe, M., Bozalek, V. & Frantz, J. (2012). A theoretical approach to technology-mediated teaching and learning in medical education. *Teaching and Learning in Medicine*.

Rowe, M., Bozalek, V. & Frantz, J. (2012). Using Google Drive to facilitate a blended approach to authentic learning. *British Journal of Educational Technology*.



Conference presentations

Rowe, M., Frantz, J. & Bozalek, V. (2011). Blended learning in clinical education: A systematic review. Poster presentation at the HELTASA conference, November, 2012, Stellenbosch University, Cape Town.

Rowe, M., Frantz, J. & Bozalek, V. (2011). Blended learning in clinical education: A systematic review. Oral presentation at the AMEE conference, August, 2011, Vienna, Austria.

Rowe, M. (2009). Collaborative knowledge construction using wikis. Oral presentation at the HELTASA conference, University of Johannesburg, November 2009.

Rowe, M. (2011). The use of a social network to facilitate the development of practice knowledge in undergraduate physiotherapy students. Oral presentation at the SAAHE

conference, June 2011, North-West University, Potchefstroom.

11.5. Limitations

This section will present the limitations of this study. The limitations of this study as a whole are presented first, followed by the limitations of each of the contributing studies.

An important limitation of this thesis is that it presents only the first of several iterations of the process. As a result, the design principles that are presented represent only a first full draft of a model for changing teaching and learning practices in clinical education. The reader should be aware that having only been tested in one iteration, the principles still lack the refinement that may improve their effectiveness. In addition, while one aspect of the initial evaluation strongly supports the development of capability in these students, the full impact of the changes will only truly be evident in years to come.

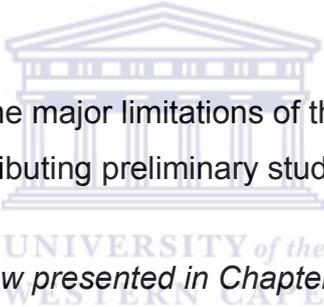
The majority of the work presented in this thesis is derived from observations and formal studies of the Applied Physiotherapy module. However, the blended approach was actually implemented across a second module, Clinical Practice, which saw learning activities integrated across the two modules. This breaking down of the boundaries between the modules saw students having to bring classroom experiences into the clinical context, and clinical experiences into the classroom. The learning tasks in both contexts were tightly integrated with each other, meaning that students had to model ways of thinking and being in the classroom that would be useful to them in the clinical environment. Therefore, this study has gone some way to addressing the challenge of bridging the knowledge-practice gap identified in studies of clinical education in all contexts. However, due to the complexity of the research necessary to adequately evaluate both contexts as an integrated system, only the Applied Physiotherapy module was described here. This therefore represents an area for future study that has significance for clinical educators around the world.

This study represents only a first, tentative step towards fundamentally changing teaching and learning practices within this department, and has opened up a discussion to drive further change. However, it is still clear that this was a small step, in only one module in one class in the department. While the results are certainly promising, the design

principles that were derived are essentially untested in any broad sense and should be recognised as such. Further research into learning designs that aim to develop capability, based on these principles, will serve to strengthen and support the claims tentatively made in this thesis.

Finally, initial resistance from both students and staff members may have impacted negatively on the final outcomes of the study, as a lot of time was taken up by having to work against attempts to undermine the process. Note that this is different to addressing student and staff concerns around the process, which is a normal and healthy aspect of an inquiry-based approach. Questioning the process comes with the development of autonomy and critical thinking, and is to be encouraged. However, colleagues who were actively working against the system in order to see it fail, was not expected. If the undermining of this process had not been present, we may have seen more positive outcomes, sooner.

Having identified and discussed the major limitations of the overall study, the following are the limitations of each of the contributing preliminary studies.



Limitations of the systematic review presented in Chapter Three. While every attempt was made to incorporate as much of the current evidence as was available, only a limited number of high-quality, relevant articles could be found for this review. This was probably due to the emerging nature of blended learning in clinical education at the time. Owing to the rapidly developing field of technology and the emergence of blended learning as a versatile and flexible approach to teaching and learning, it is clear that new publications are already available, which would significantly alter the results of this review. The impact of this on the overall study is difficult to determine, but a larger dataset of publications may have helped narrow the description of the problem, or identify additional variables to consider in the overall project design.

Limitations of the survey presented in Chapter Four. Considering that most of the participants in this case study were female (73%), the results might represent a gender bias. In addition, almost half of the participants were in their first year of study, suggesting that they may not yet have developed the necessary skills to make use of more

sophisticated learning strategies. Since the survey was conducted in the entire department, the range of experience in terms of learning practices was varied, and would therefore have been better evaluated by analysing the results by year level. This may have assisted the researcher in developing a better understanding of technology use and learning practices within year levels.

Limitations of the narrative review presented in Chapter Five. Narrative literature reviews are limited in the sense that the researcher can determine the direction of the review. The results are inherently biased towards an outcome that the researcher wants to present. The selection of evidence to support a point of view is subjective, and not evaluated against any criteria of methodological quality or study aim. However, it is noted that the review of literature in design research is not an isolated activity, and the results of the review are continually revisited as the design principles are refined based on further study and additional reviews of the literature (Herrington, McKenney, Reeves & Oliver, 2007).

Limitations of the survey on the use of a wiki for collaborative group presented, in Chapter Six. This survey was carried out in one university physiotherapy department with a small number of participants (n=37), which means that the results cannot be generalised to broader contexts. However, these results may still have value for clinical educators who are interested in exploring wiki-based projects in their own fields, since the results of this study highlight challenges that are by no means endemic to this population. In addition, this group of students were purposively selected because they were registered for a module I was teaching. However, they were not the same students who formed the sample for the intervention aspect of the study, which may have had an impact on how the intervention was run, and the feedback that students gave.

Limitations of the content analysis on interactions in the social network, presented in Chapter Seven. Care should be taken when interpreting the results of this study, as students' understanding and actual clinical reasoning were not evaluated. While the study demonstrated that it was possible to use an online social network as a platform for developing reflective practice, it did not aim to demonstrate an improvement in capability. However, acknowledging that reflection is an important aspect of capable practitioners, would suggest that this approach may have a role to play. It may also have been useful to

include a short survey following completion of the assignment in order to evaluate students' perceptions of the process. This may have provided insightful information in terms of improving the process for later aspects of the project. Finally, it may have been useful to have students from both year levels read and comment on the posts of students in other classes i.e. for the third year students to read and comment on fourth year experiences. This could help them to prepare for the challenges to be expected in their final year. It would also give the fourth year students opportunities to provide feedback to third years, helping to guide the less experienced students by using their own personal experiences. The sample used in this study was also different to the group of students who were part of the blended learning module.

Limitations of the Delphi study presented in Chapter Eight. This study had an inherent selection bias, since the panel participants were selected by the researcher based on personal and professional connections to them. This selection bias may have had an impact on the outcomes of the each stage of the study, which would certainly have affected the final design principles. In addition, unlike a traditional Delphi study, there was only a limited opportunity for participants to review their responses in summary since each expert panel was different and not every member of the panel had provided input into the survey they received. However, since there was no aim of determining consensus in this Delphi, this is unlikely to have affected the outcome.

Limitations of the focus groups presented in Chapter Ten. One of the limitations of this paper is that it only describes the focus groups that were held at the end of the first semester, meaning that these outcomes represent one snapshot of the process at a relatively early stage. It would also be useful to conduct another set of focus groups at the end of the first year, which would enable the tracking of change over time. This might have served to describe a more complete and accurate picture of the process, rather than only a single snapshot.

11.6. Recommendations

The major recommendation to emerge from this study is that clinical educators should consider the use of these design principles to inform the creation of learning environments

that aim to develop capability in undergraduate physiotherapy students. While the design research process has informed a rigorous method of developing the principles, they have not yet been tested in other contexts. The use of these principles in this department as part of successive iterations is needed in order to refine the design principles. However, they should also be used to create other learning environments in different contexts, using different platforms, which will lead to the development of more robust versions of the principles.

It is noted that the changes resulting in higher levels of performance are often not sustained, as participants may lose the confidence that initially led to a change in behaviour. It is not enough that change is created, but that it is sustained through long-term institutional support and a cultural change driven by individual empowerment (Welch & Dawson, 2006). This approach to teaching and learning could be supported by using more experienced staff members, who are more secure in their careers and therefore less likely to feel threatened by a change in practice. Facilitators should be carefully chosen, as the role requires a particular attitude towards teaching and learning. Those who are comfortable facilitating student learning are less likely to feel threatened with inquiry and more likely to encourage the development of self-directed learning. They should be people who enjoy teaching, as well as *thinking about teaching*. Diversity of the team is also an important consideration, as it requires a role change from content expert to facilitator, which is easier when working with others (Justice, Rice, Roy, Hudspith & Jenkins, 2009).

Finally, it is clear that design research is an appropriate method to evaluate the impact of innovative approaches to teaching and learning practices in clinical education. The approach describes a rigorous method for designing and running studies that aim to go further than simple descriptive research. Clinical educators and researchers who are investigating any aspects of complex systems, including healthcare and education, are encouraged to consider design research as a useful method for designing their projects.

The section above presented the overall recommendations of the study. The section below presents the recommendations of each chapter separately.

Recommendations following the systematic review in Chapter Three. The limited pool of studies that were found suggests that there is a gap in the field for high-quality research that investigate the use of blended learning in clinical education. The results of this review indicate that further research in this area is necessary before educators make assumptions about improved qualitative outcomes when integrating technology into teaching and learning practices. Not only is more research needed, but it must be better research that goes further than simply describing practical demonstrations of how technology was used to deliver content in different ways. Researchers should base their studies on theoretical frameworks that aim for transformation in teaching and learning, rather than simply being more efficient. Studies should begin with the theory that is necessary to bring about fundamental change, and only then investigate the affordances of technology that can satisfy the requirements of the theory.

Recommendations following the survey in Chapter Four. Even though most students have regular access to the internet and would seem to use it often, many lack the deeper understanding of technology that would allow them to make effective use of it as part of their studies. If clinical educators aim to integrate technology into the curriculum, care should be taken so as not to make assumptions that students' use of the tool equates to understanding of it. The innovative use of technology must take into account not only students' access to, and use of, technology, but their understanding of how to use those tools within the context of learning.

Recommendations following the narrative review in Chapter Five.

In this paper we explored technology-mediated medical education from a socio-cultural perspective that supports the social aspects of learning in clinical teams. We identified instructional frameworks that were based on those theories of learning, which could be used to guide teaching practices that can take place in both online and physical spaces. And finally, we discussed the development of cognitively authentic tasks that medical educators can use to create learning activities that more accurately reflect the dynamic and complex healthcare environments in which medical graduates are called to serve. If we are to take seriously the call for reform in medical education, rather than continuing to base teaching on models that emphasise the individual, we should view our teaching practice through the lens of socio-cultural learning theories that inform the design of

authentic tasks, and which are cognisant of the affordances of technology. There is a wealth of social learning theories from the social science literature that are available to medical educators. These have the potential to inform the design of new curricula that prepare students for the dynamic, complex context of clinical practice, especially if we want to begin integrating technology into teaching in a serious way.

Recommendations following the survey in Chapter Six. The introduction of innovative teaching and learning tools into the traditional classroom has the potential to enhance teaching and learning practice, but it must be tempered with care and deliberation. If clinical educators are considering the use of social software, they must ensure that students are well-prepared and supported throughout the process. The use of online tools for collaborative groupwork should seek to enhance, rather than drive, the learning experience. In addition, educators may find that the affordances of the technology are negated if students do not use it effectively because of other challenges. In this example, the collaborative affordance of the wiki did not significantly enhance the students' learning, because of their difficulty working in groups. This had little to do with the technology, and could have been addressed by helping students to negotiate the challenges of group dynamics in the early stages of the process. Educators who would integrate technology into the curriculum should ensure that support is provided holistically, rather than only around the technology.

Recommendations following the content analysis in Chapter Seven. Even though students' self-report indicated that they were regular users of online social networks in the context of their social lives, this familiarity did not transfer well into the educational context. High levels of feedback may be required from facilitators in order to guide students towards using the technology for learning practices. Educators must understand that the educational context of using technology differs significantly from students' social use of the tools. Workshops held early on in the process will be essential for many students to get a better understanding of how to use the technology within the context of clinical education. Educators should not make assumptions about students' ability to engage with each other using online social networks. And finally, any use of technology to support changes in teaching and learning practices should take place within the context of a constructively aligned task, rather than simply for its own sake.

Recommendations following the Delphi study in Chapter Eight. There are changing conceptions around the knowledge, skills and attitudes required for professional practice, which shift the focus from the products of learning to the process of learning. Clinical educators must move beyond describing students in terms of what they should know and be able to do, and develop teaching strategies that facilitate a state of professional *being*. Teaching practices should aim to integrate knowledge from different curricular domains, encourage interaction rather than transmission, and should accommodate guided, reflective activities that include feedback. Integrating technology has the potential to fundamentally change teaching and learning practices that aim to develop healthcare students who are better equipped to deal with the complexity of clinical practice. However, clinical educators should be guided by principles that reflect outcomes that are framed in the context of what they want students to be, rather than what they should know or be able to do. Finally, the specific technologies that are chosen are less important than the teaching and learning environments that are created.

Recommendations following the design and implementation in Chapter Nine. When preparing to implement an innovative change in the curriculum, ensure that other members of the team are familiar with the project, not only in terms of logistics, but also in terms of the underlying reasoning behind design choices. If colleagues are used to traditional teaching methods, some of the changes may seem counter-intuitive. Without a good understanding of why certain choices were made, they may resist the process while at the same time claiming to support it. Changes within a university can be slow and difficult to manage. An important strategy to support this change is to encourage discussion and debate about the suggested change, which can help identify those who are receptive to it, as well as develop counter arguments against those who are resistant (Justice, Rice, Roy, Hudspith & Jenkins, 2009).

Ensure that the selection of technology platforms are made on the basis of the affordances of the technology, and how well the affordances map to the requirements of the learning design. No matter how well the learning environment is designed and implemented, it is still essential that attention is paid to the rest of the curriculum. Learning activities should still be aligned with module outcomes and quality content. Assessment tasks need to be

moderated to ensure that they are aligned with outcomes, content and activities. In other words, the design of the learning environment is only one aspect of teaching and learning, and the rest of the components cannot be neglected.

Recommendations following the focus groups in Chapter Ten. When considering the integration of technology into the curriculum, educators should begin with what they want to see in their students, identify theoretical frameworks that have been shown to lead to those outcomes, and only then choose technology platforms whose affordances meet the requirements of the theory. Furthermore, if clinical educators aim to develop critical thinking within their students, they should consider the use of authentic activities that are integrated across physical and online spaces, rather than isolating the different learning environments. Finally, when colleagues make assumptions about what inquiry-based approaches to teaching and learning mean, it can lead to their rejection of the idea. Another objection that may be encountered is that inquiry focuses more on skills than on discipline-specific content, thereby “undermining students’ education”. If given the opportunity, try to address these challenges by sharing information and explaining the idea of inquiry, provided that opponents to the idea are open to listening.



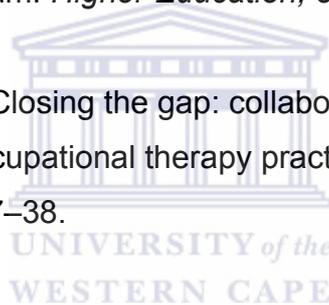
11.7. Conclusion

This chapter has described the final outcomes of this study, beginning with the major contributions made by each study to the development of the design principles. These design principles present a practical implementation model for clinical educators who aim to develop capability in their students. While the model does not require the use of any specific technology (or, in fact, any technology at all), it is noted that implementation of the principles is enhanced and supported through the use of appropriate technology platforms whose affordances map to the implementation of the principle. In addition to the design principles, the chapter highlighted contributions to the body of knowledge that have emerged from the various studies presented here. Finally, the limitations and recommendations of the thesis were described.



11.8. References

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12. Appendices



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12.1. Appendix I: Informed consent to participate in the project

RE: Participation in a PhD research project

Dear 2nd year student

My name is Michael Rowe and I am a PhD student in the Physiotherapy department at the University of the Western Cape. My research project is to evaluate a blended approach to clinical education in the undergraduate physiotherapy degree. Two of the most challenging aspects of physiotherapy education are:

1. Developing clinical reasoning skills that allow you to solve complex, patient-related problems
2. Applying the knowledge you develop in the classroom, to patients in the real world

As part of modifying our curriculum in an attempt address these challenges, you are being asked to participate in a research project. I will be trying to evaluate the changes made in the Applied Physiotherapy (PHT203) and Clinical Practice I (PHT110) modules, in order to determine if the new approach has better educational potential than our traditional teaching and learning practices.

As you have been informed, the above modules will be conducted both in the classroom and in the online space. My research will involve looking at your interaction in both of those spaces and try to evaluate their efficacy at developing clinical reasoning ability, as well as the application of “classroom knowledge” to patients. The information you provide for this study will help us in the department to improve our understanding of a blended approach to clinical education. You may benefit from this research in future years as we continue with our process of curriculum development.

Participation in this study will, in most cases, mean nothing more than allowing me to use evidence of your engagement for my analysis. In other words, you will do everything in the module exactly as you would if there were no research being conducted. However, during the course of the first semester, I may ask for your permission to record a conversation that you're a part of, or take a video of an activity you're involved in, or to ask you some

questions, either as part of an individual interview or a focus group. In addition, I will also be looking at your assessment tasks, reflective writing and patient interactions.

While you do have to complete these activities as part of your degree, you do not have to give me your permission to analyse them. Your participation is entirely voluntary, and you can withdraw your consent at any time. In other words, if you sign this consent form but later on decide that you're not comfortable, you can still ask to withdraw. Your refusal will not influence your current or future relationship with anyone in this department. There are no perceived discomforts or risks anticipated in participating in this study. There are no costs and/or compensation for agreeing to participate. All of your interactions in the classroom and social network will be anonymised before being analysed.

This study has received ethical clearance from the University of the Western Cape Ethics Committee (project registration number: 09/8/16). In addition, permission to conduct this study has been provided by the Head of the Physiotherapy Department, Professor A. Rhoda.

You have been informed about the purpose of this study, and the procedures, possible benefits and risks. By choosing to participate, you are not waiving any of your legal rights. If you have any questions regarding this study, either now or in the future, please feel free to contact the primary investigator, Mr. Michael Rowe, at michael@realmdigital.co.za.

- I have no further questions about this study. The information has been explained to me to my satisfaction.
- I consent to participate in this study, acknowledging that I may withdraw at any time.

Name: _____

Signature: _____

Date: _____

12.2. Appendix II (Survey used in Chapter Four)

To determine physiotherapy students' knowledge, skills and attitudes towards the use of emerging technologies to change teaching and learning practice

Please take a few minutes to complete this questionnaire. Your responses will assist the researcher in better understanding how to implement projects that make use of emerging technologies within the department. Your participation in this survey is voluntary and there will be no negative consequences for you should you choose not to participate. If you do choose to participate, you may withdraw at any stage. No personally identifiable information will be collected, and you will remain anonymous throughout the process. Permission to conduct this survey has been obtained from the Head of the Department and the Registrar of the university.

Social networks are an increasingly common online platform for people of all ages to interact and communicate with friends, family and even strangers. This survey will establish a baseline understanding of your ability to participate in a social network. A social network was chosen as the platform to evaluate “emerging technologies”, since many common online tools are incorporated into social networks. For this survey, social networks can be thought of as any online community that makes use of multiple communication channels (e.g. direct messages, public messages, personal status updates and forum discussions) that allow the sharing of media (e.g. text, images and video) between people with shared interests (e.g. physiotherapy students). Common examples of social networks are Facebook, Mxit, MySpace, Twitter, Flickr, YouTube, and Delicious.

By ticking this box, I agree to participate in the study. I confirm that the reasons for the study have been explained to me in a manner that I understand and that all of my questions have been answered to my satisfaction.

Section A: this section is about your access to the internet

1. Where do you use the internet most often (you may make multiple selections)?
 Home Campus Internet café Friend Family
 Other (please specify) _____
2. If you use the internet at home, what type of internet connection do you have (please skip this question if you do not have internet access at home)?
 Dialup (you plug the phone line into a modem when you want to use it)
 Broadband / ADSL (the internet is always on)
 3G (you use the cellphone network by plugging a small USB device into the computer)
3. How often do you use the internet?

A few times a day Once a day A few times a week Once a week

4. How do you access the internet (you may select more than one option)?

Desktop computer Laptop Cellphone

Section B: This section is about your participation in social networks

5. Do you belong to any social networks e.g. Facebook, Mxit, MySpace?

Yes (please answer Questions 6-9 after ticking this block)

No (please skip to Question 10 after ticking this block)

If you answered Yes to the question above, please answer the following:

6. How often do you check it? Hourly Daily Weekly Monthly

7. What is the best thing about participating in a social network? _____

8. What is the worst thing about participating in a social network? _____

9. Do you use your social network as part of your studying? Yes No

1. If you answered Yes to the question above, please explain how you use your network as part of your studies _____

2. If you answered No to the question above, please explain why you do not use your network as part of your studies _____

10. Please indicate which of the following you have performed in the past month (you may make multiple selections):

Uploaded pictures to a photo sharing service (e.g. Flickr, Photobucket)

Used on article on Wikipedia to learn about something

Edited an article on Wikipedia

Watched a video on a video sharing service (e.g. YouTube, Vimeo)

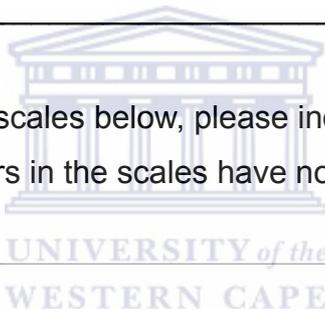
Uploaded video to a video sharing service

- Created a blog post
- Added a comment to someone else's blog post
- Read a comment on Twitter
- Sent a message on Twitter
- Shared a bookmark on a social bookmarking site (e.g. Delicious, Diigo)
- Joined a group on a social networking site (e.g. Facebook, MySpace)

11. What the following words and phrases mean to you (please write *N/A* if you don't know what they mean):

1. Wiki _____
2. Blog _____
3. Podcast _____
4. Blended learning _____
5. Reflection _____

12. Using the visual analogue scales below, please indicate how you feel when you are working online (the numbers in the scales have no numerical value and will be used for coding purposes only)



I feel confident when I'm online					I feel lost when I am online				
1	2	3	4	5	6	7	8	9	10

I enjoy sharing things online					Sharing online makes me nervous				
1	2	3	4	5	6	7	8	9	10

I feel excited about using new online tools					I feel anxious when using new online tools				
1	2	3	4	5	6	7	8	9	10

I want to learn more about the internet					No thanks, I know everything I need to				
1	2	3	4	5	6	7	8	9	10

Section C: This section is about your studying preferences

13. Do you use the internet as part of your studying? Yes No

14. If you answered *Yes* to the question above, please explain how you use the internet

to study _____

15. If you answered *No* to the question above, please explain why you don't use the internet to study _____

16. How do you learn best. You may make multiple selections?

- Memorising printed text (e.g. handouts, course readers)
- When you have pictures (e.g. illustrations, diagrams)
- Informal discussion with others (e.g. on campus)
- Formal study group sessions
- "Cramming" the night before

17. Do you enjoy working in groups? Yes No

18. What is the best thing about working in groups? _____

19. What is the worst thing about working in groups? _____

20. Please indicate how you feel about the following statements:

A = Strongly agree B = Agree C = Uncertain D = Disagree E = Strongly Disagree

- _____ I wish we could have more discussions in class
- _____ I think that reflection is an important part of learning
- _____ I struggle to apply theory to practical situations
- _____ Getting feedback from lecturers on tests and assignments makes me feel anxious
- _____ Lecturers in this course are difficult to approach
- _____ Lecturers in this course do not provide useful feedback

Section D: This section is about teaching within the department

21. Do you find lectures to be an effective way for you to learn? Yes No

22. What (if any) alternatives to lectures would you prefer to be used in the department? _____

23. Do you think that web-based tasks, in addition to lectures, might improve your own learning? Yes No

24. Please explain your answer: _____

25. What, if anything, would you change about the way subjects are taught in the department? _____

26. Would you like to have more face-to-face contact with lecturers? Yes No

27. Would you like to have other channels of communication with lecturers?
 Yes No

28. If you answered Yes to the question above, can you suggest alternative means of communication that you would like to have available to you? _____

Section E: This section is about your demographic information

29. Are you Male Female?

30. What year of study are you in? First Second Third Fourth



12.3. Appendix III (Survey used in Chapter Six)

The aims of this questionnaire is to evaluate your experiences using a wiki to facilitate collaborative learning as part of the PT403 Applied Physiotherapy module. Completion of this questionnaire will assist the department in making decisions about the use of this tool in the curriculum.

You are not obliged to complete this questionnaire. If you do, no personally identifiable information will be collected to ensure your anonymity. Should you have any questions regarding the survey or any part of the questionnaire, please ask the lecturer. Your consent to participate is implied by the completion and submission of the questionnaire.

Demographic information

1. Age: _____
2. Male Female
3. Race:²⁹ _____
4. Do you have access to the Internet at home? Yes No
If you answered No, where did you work on the assignment? _____

Preparation and ability to use a wiki

5. Had you ever heard of a wiki before working on this assignment? Yes No
6. Had you ever edited a wiki before working on this assignment? Yes No
7. How did you initially feel when you learned that you would be using a wiki to collaboratively write the group assignment? _____

8. Were you adequately prepared to use a wiki during this assignment? Yes No
9. Was there anything more that the lecturer could have done so that you were better prepared? Yes No. Please explain your answer: _____

10. How did you feel knowing that your work was visible to the world?

²⁹ The use of racial categories recognises the socio-economic impact of the inequitable distribution of resources under the policy of apartheid prior to 1994. The categories used in this evaluation were based on the government's racial classification system during that time.

Using a wiki to stimulate interaction and collaborative learning

11. How did you feel about the peer review process, i.e. that your peers were looking critically at your work and making or suggesting changes? _____

12. How did you feel about reviewing another group's work as part of your assignment?

13. Please indicate, on a scale of 0-10 (where 0=no useful input and 10=excellent input):

Your contribution to the assignment: ____

The rest of your group's contribution to the assignment: ____

14. Did you do more research than you would usually do before posting content online, knowing that others would be able to see your work? Yes No

15. Did you make use of the following features of the wiki?

1. Discussion: Yes No
2. History: Yes No
3. Summary: Yes No
4. Preview: Yes No
5. Adding images to your article: Yes No
6. Adding links to your sources of information: Yes No

16. Please indicate how you feel about the following statements:

A = Strongly agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly disagree

1. ____ Using a wiki helped me to learn more about the topic than if I had completed the assignment alone
2. ____ Using a wiki helped me to learn more about the topic than if the group had met in person
3. ____ I just worked on my own content and didn't pay much attention to what the other members of my group were doing
4. ____ Using a wiki is a good way to work on group assignments / projects
5. ____ Using a wiki is the best way to work on group assignments / projects

Is there an educational advantage to using a wiki for groupwork?

17. Did you feel that the following objectives of the assignment were met?

A = Strongly agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly disagree

1. ____ We produced an article of high quality that contributed towards my understanding of our topic

2. ___ We made a useful contribution to the body of knowledge that may help others
3. ___ We collaborated on a project with others who were geographically separate
4. ___ I improved my academic writing skills
5. ___ We learned about the peer review process by providing comments to others
6. ___ I learned something about copyright and plagiarism
7. ___ It helped me to understand the importance of drafting i.e. progressively improving a document through feedback and further research

18. How do you feel about the quality of the article your group produced? Explain your answer: _____

19. Do you think that a wiki is a useful way of doing group work? Explain your answer: _____

20. Do you think you completed a better, or worse group assignment than you are usually capable of because of the use of a wiki? _____

21. Please indicate how you feel about the following statements:

A = Strongly agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly disagree

1. ___ Using a wiki encouraged me to work with the others in my group
2. ___ Getting feedback and links to further resources helped the group to produce a better quality article
3. ___ I better understood the importance drafting an article using feedback
4. ___ Using a wiki made it possible to create a better article than if it was on paper
5. ___ My writing skills improved by working with the other members in my group
6. ___ I feel more confident with groupwork after this assignment

22. Did you learn any other skills through participating in this process? Yes No
If you answered Yes, what were they? _____

23. Did you feel that the technical aspects of using a wiki affected the quality of your assignment? Yes No. Explain your answer: _____

24. Did you use the additional information provided by the lecturer and your peers through links to further resources? Yes No

25. Would you recommend the article your group produced to someone searching for information on your topic? Yes No

Experiences with using a wiki

26. Did you feel that using a wiki was easier, or more difficult than preparing a written group assignment? Please explain your answer: _____

27. Did you enjoy the process of doing this group assignment? Yes No

28. Would you like to use wikis for other assignments as part of the physiotherapy curriculum? Yes No

29. What was your biggest challenge during this assignment? _____

30. What other challenges did you experience during the assignment? _____

Thank you for taking the time to complete this survey



12.4. Appendix IV: Reviewer comments (Chapter Three)

See below for the feedback from reviewers following the initial submission of *The role of blended learning in the clinical education of healthcare students: A systematic review to Medical Teacher*.

Reviewer(s)' Comments to Author:

Reviewer: 1

Comments to the Author

Blended learning is accepted as part of health science education but its place in the clinical situation has been under-researched. It has been woven into the fabric of clinical tuition without rigorous attention to its role or its success.

The review of the literature underlines the paucity of information on the topic at a pedagogic level. Indeed the fact that only 7 publications over the last decade were found of sufficient quality speaks to the lack of research that has accompanied this fast-developing domain.



The variety of approaches qualitative and quantitative, controlled or uncontrolled together with the spectrum of courses and countries allows only very broad conclusions to be drawn. Also the numbers involved are small and the long-term effects not recorded.

It is a pity that more data are not available and perhaps this should be the thrust of the piece.

There is no doubt that this review is a scholarly piece of work but the depth of the material presented does not really justify the conclusions reached. According to the articles selected blended learning can be applied over a wide range of situations using a range of interventions and all seem beneficial.

There also needs to be reworking of the language. Avoid sweeping, almost patronising phrases like "This tacit understanding of practice knowledge is deep and complex" or

“Educators should seek to establish helpful relations with students” which are not central to blended learning or the review. The sentence starting “At this point in time” is not English, so lots of rewriting would be necessary.

Reviewer: 2

Comments to the Author

Comments

This is a very well written and organized review paper which is

1. clearly written
2. describing a very well designed study, and an excellent example and model to emulate on how to perform a review study
3. comprehensively covers the review area for the period in question (2000 to 2010)
4. is informative
5. and I enjoyed reading the paper immensely, and gained insights from reading the paper

My response to the editor:

Dear [editor]

Thank you for the opportunity to publish my paper in Medical Teacher. As a novice researcher and author I appreciate the chance to have my work appear in your journal, regardless of the format.

I have done what I could to address the reviewers' comments and I hope it is to their satisfaction. However, I am concerned that the first reviewer has done little to provide explicit direction in terms of the changes they expect to be made and so am uncertain that what I've done is sufficient. I have reworked the conclusion to be more broad in light of the paucity of available research. I have also added a greater emphasis on the lack of available data, and highlighted the lack of depth in terms of the available research.

The suggestion to rework the language to avoid the "sweeping, almost patronising phrases" gives little guidance as to what exactly is patronising, other than providing 2 examples (which are paraphrases of the original studies). I have changed the offending sentences and, together with my co-authors, have tried to make sure that there are no other examples in the text.

On the next point, I agree with the reviewer that contextualising clinical education and practice knowledge is not central to the theme of "blended learning". However, this paper sought to explore the use of "blended learning in clinical education". The aim of the Introduction was therefore to establish the many challenges inherent in clinical education as it relates to education and practice, and then to move toward exploring blended learning as a potential tool in addressing these challenges. In this light, it seems imprudent to remove the background on the complexity of clinical education and practice.

I have changed the phrase "At this point in time", although I disagree with the reviewer that it is "not English". However, it is no doubt a colloquialism and the sentence does read better without it.

All of the changes made have been highlighted in the attached document.



12.5. Appendix V: Reviewer comments (Chapter Four)

See below for the reviewers comments for *Physiotherapy students' use of emerging online technology as part of their learning practices*, any my response to the reviewers.

Feedback from reviewer. *Note that the second reviewers' feedback was limited and offered little that would be useful in this Appendix.*

The introduction provides valuable resources and information on the technology in learning. It highlights the need for development in this topic.

The 1st paragraph was a bit confusing as it focuses on reflection and other generic skills, whilst from the title one expected something different. I suggest that the 1st paragraph, which invites the reader into the paper, links more clearly with the title and the aim of the paper. The inclusion of the critical cross field outcomes as stipulated by SAQA, would further strengthen the argument of generic skills needed to become a health professional.

The introduction needs to illuminate the link between development of generic skills and technology assisted learning. What are the advantages and the disadvantages? How can it contribute? The authors should also include some contextual information regarding the South African situation, in which resource constraints in terms of technology might play a role in the use and the ability to use technology for learning.

The introduction and discussion focuses on the use of TEL during clinical practice, yet the survey instrument does not contain this link to clinical education. The focus on clinical education is thus not substantiated and thus unfortunately unclear.

The introduction does not motivate the research aim. There seems to be incongruency between the aim and the rationale for the study. There needs to be clearer information on why it is necessary that we should know if students are familiar with TEL and how they use it.

Currently the introduction motivates the following research aim/question: does TEL

enhance the development of non technical skills during clinical education.

The author should thus in the introduction include elements that focus on student skills and knowledge regarding TEL.

The methodology indicates that the research was conducted at one institution, thus the research aim cannot include 'South African' as not all SA Physiotherapy students were surveyed. Thus a case study.

Some contextual information regarding the University's policy on TEL and the inclusion of TEL in the Physiotherapy curriculum would be useful in terms of generalising the results of the study and can explain the participants' responses.

The inclusion of participants who do not have clinical experience further strengthens the question about clinical education as the basis in the introduction.

The information on the reliability and validity of the survey is valuable. More information is needed on the content and the development of the questionnaire, to demonstrate that the aim and the survey link. (A box or table with categories and references would suffice).

The procedure and ethics is clear.

For the results, I suggest that the profile of the participants be provided its year of study and gender for each year group. This is to monitor for potential response bias.

It seems that the participants were asked about very particular TELs. I am thus unsure if the research aim is achieved in its entirety. If the aim was to determine which TELs the students were familiar with – an open question or more options should have been included. The options in table 1 & 2 should thus include more options. This highlights the importance of providing a context of the University and Physiotherapy Departments current inclusion of TELs in the curriculum.

The Discussion is good in that it communicates the results of the study accurately and

clearly. The link made to clinical education and generic skills is again unsupported as the survey did not ask specific information about these aspects.

I recommend the following limitations:

Gender bias

Case study – thus only generalisable to similar contexts

? questionnaire design into specific aspects being asked for.

My response to the editor

Dear Editor

Thank you for the opportunity to publish in SAJP. I have addressed the reviewers' comments in the following ways:

I worked on the Introduction to better align it with the aim of the study. I also tried to clarify this section, in order to improve clarity, as one reviewer remarked that it was not particularly clear why some information had been included, and even why the study was conducted. I also worked to make clear the link between non-technical skills, TEL in the classroom, and the importance of determining students' understanding and use of technology before implementing TEL.

I added some basic information on critical cross field outcomes as per the suggestion of one reviewer. I also included a brief discussion of the challenges of using technology-enhanced learning in a South African context.

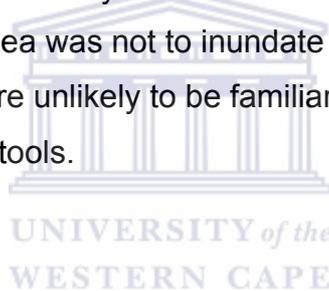
Since the Method and Theoretical components were highlighted by one reviewer as weaknesses, I tried to strengthen those sections in particular. However, without specific guidelines, I'm not sure that I addressed what the reviewer was referring to. There were additional suggestions by the other reviewer with regards the Method section that were addressed i.e. further details of the Likert scale, as well as basic grammatical changes.

I removed all references that might suggest the study included students from more than one department. The study design was changed to reflect the fact that it was in fact, a case study.

I have included additional information on the development of the survey instrument, including the categories used.

I modified the Discussion to exclude the statements made which were not supported by the results, particularly those that dealt with the use of TEL in clinical education and the development of generic attributes. The survey questions did not elicit this information and so claims made in this study could not be supported. In addition, I changed all instances of "clinical education" to "healthcare education", to avoid confusion between classroom learning and clinical practice. The focus of this paper was to look at TEL within the classroom, not in the clinical context.

The comment about the inclusion of additional online tools and services in the survey was taken into consideration. However, no changes were made, other than to explain why those particular tools were included. They are the most common, generic tools that emerge from the literature. The idea was not to inundate the participants with many examples, most of which they were unlikely to be familiar with. The idea was to ask if students used the most common tools.



12.6. Appendix VI: Reviewer comments (Chapter Six)

See below for the comments from reviewers following the initial submission of *The use of a wiki to facilitate collaborative learning in a South African physiotherapy department*.

Reviewers comments

Overall recommendation: The manuscript has potential for publication but needs comprehensive revision to improve its scholarly contribution.

The study investigate an innovate tool in collaborative teaching and learning. The main shortcoming is the lack of an underpinning conceptual framework, which leads to incoherence between background, aims, methods and findings. From the quotes (of participants) it appears as if a more in-depth and bigger move towards theory development can be done, as the qualitative data were apparently inductively analysed.

Recommendations:

Revise the Introduction and background to conceptualise “facilitation of collaborative learning” (No theory about the main concept of the study in the introduction) to show the gap in the literature. “Few studies have been conducted in South Africa and in particular, among healthcare students” The introduction needs to be concluded with a brief summary of these studies, illustrating the gap. Move the definition and explanation of the wiki earlier. Re-think the formulation of the “Aims and objectives”

First objective: “‘Effectively’ use a wiki to develop contextually relevant content”

“Effectiveness is the extent to which an activity fulfils its intended purpose or function.”³⁰

“The extent” implies that clear criteria are used, which I could not find.

What is meant by “contextually relevant content”. How was this “measured”? It is also not clear wether the focus is on the “development” or on the “content” or on both.

(The results report mainly elements of the process; however, how relevant is a quality process if the quality of what was presented is not accurate. To determine the latter clear content-specific criteria are needed and the evaluation possibly needed to be done by the

³⁰ <http://www.qualityresearchinternational.com/glossary/effectiveness.htm>

facilitator who presented the content of the module”

Similarly with the common understanding of “evaluate”: “The purpose of the evaluation is to determine whether outcome criteria have been met” and “The basic components of evaluation are (1) identifying the parameters of the subject of appraisal, (2) developing criteria specific to the topic within the parameters, (3) data gathering, (4) measuring the data against the criteria, and (5) employing the results of assessment for improvement of the process, status, behavior, or activity evaluated.”³¹

Perhaps the study was rather an exploration of the **outcomes** of the wiki assignment? (The questionnaire determined “students’ experiences and perceptions”).

Perhaps expand the Research Setting by informing the reader briefly about the experience that these students have in (a) collaborative / group work and (b) using social software, situating them in the “NetGeneration” or not.

Complement the Methods section. (This seems like a long list, but if woolly parts are deleted should not add many more words)

Give an example of the “module specific learning outcomes”

Give the “(certain) generic attributes” (What is meant by “innovative knowledge”) Three possibilities that I identify in the two tables are

- Giving and receiving feedback
- Collaboration
- Writing skills

Clarify the role of the facilitator: About a third of the Introduction is spent on the theory of assisted performance where it is defined by processes by the FACILITATOR

Methods: Involvement of facilitator not described

Results: Only peer review is reported

Discussion: “Instances of plagiarism was identified by the instructor”

How were groups allocated: at random or according to criteria or did students group themselves? (This may be a point that you want to discuss when interpreting the finding of the experience of a low level of collaboration)

Give the open questions, or at very least the topics that they covered.

How was “content validity ... addressed”? (See Limitations). Especially in light of the

³¹ <http://medical-dictionary.thefreedictionary.com/Evaluation+research>

apparent absence of a clear conceptual framework.

Describe/ refer to the 1 to 10 scale, and how “on average” was determined. What was the cut-off to differentiate between the perception of good and bad quality content?

State the specific quantitative statistics as it seems only two were applied: frequencies and proportions.

With a sample size of 47 analytical statistics should be possible. Were a statistician consulted about possibilities, as that could enrich the findings investigated?

Describe the method used to analyse the qualitative data and strategies used to ensure that the reader can trust the findings. It appears as if only first cycle coding methods were used.³²

Rephrase the statement about ethical clearance to be more positive: something like: clearance was obtained as part of a broader PhD study (I assume). (rather than saying clearance was not sought)

Synthesise the qualitative results with either a diagrammatic framework OR a table with the themes and comprising categories

E.g. Theme: Hindrances in accessing the internet

Categories:

- Lack of internet access at home
- Insufficient infrastructure: slow downloading (home and/or campus?)
- Insufficient on-campus internet facilities
- Cost of getting to campus (?from clinical areas) to use on-campus internet facilities

Revise the Discussion. I suggest the following sequence:

- Start discussion by linking with the aim of the study and the main findings.
- Discuss the characteristics of the sample (demographics and internet literacy).
- Discuss the *quantitative* findings according to the research aims. (The two tables)
- Discuss the *qualitative* findings according to the themes by answering the following questions for each theme. (That would prevent the current situation where elements of collaboration are discussed under different headings/aims.)

The questions that needs to be answered are:

- What was found?

³² Saldana, J. 2009. “The coding manual for qualitative researchers”. London, Sage.

- How does this compare with other studies?
- Was the finding what was expected, and if not, why not?
- How can the finding be explained?
- What does the finding mean?

(Discuss in the SAME order as given in the Results section)

Add the fact that students were orientated only about the use of the wiki itself and not about collaboration, as a short-coming.

For each finding give the practical implications of using a wiki for collaborative a) learning and/or b) teaching

Facilitation of learning (Using the same theme as example than in item 5 earlier

To facilitate access to the internet, it must be ensured that there are sufficient and efficient (quick) on-campus facilities. Would the option exist (like at my institution) where a computer laboratory can be booked for certain periods during lecture time for those students who do not have internet access at home. Or Could students' internet-café usage be subsidised? ;-)

Facilitation of teaching, e.g. practical specific ideas on orientation to such an assignment ALSO within a constructivist paradigm. HOW will collaboration be facilitated? (This may be brief if it is clearer from the intro what the properties of collaboration are.)

What about adding a practical implication for the majority of the readers of the journal: future benefits to graduates with experience in a community of practice.

The revision will grant the author(s) the opportunity to correct the following perceptions of the reader

The suspicion that the analysis was done in just as careless a manner as the preparation of the List of References

Not according to the style guidelines of the journal eg position of the date.

Numerous inconsistencies (See attachment)

One gets the feeling that the author(s) were insensitive to the voice of the participants:

Author(s): "It should ... be noted that students who paid for access at internet cafes did this because they chose not to use computer labs when they were on campus..."
 However, a clear challenge that was reported was that the on campus facilities were often already occupied by other students and that it was costly to get to campus?

In light of the comprehensive revision recommended only some language queries are shown with track changes in the attached version of the manuscript.

Congratulations to the author(s) with original research. It would be worthwhile to put in the effort so that the article doesn't end up with the verdict: "While there has been an explosion of research on online learning, much of this research has been atheoretical and fragmented" (Akoyl and Garrison) (You may find the Community of Inquiry framework interesting)

My response to the reviewers

To the Editor

Please find attached my article "The use of a wiki to facilitate collaborative learning...". I have addressed the reviewers comments to the best of my ability. See below for the details.

All in-text citations and items in the reference list have been correctly formatted according to the journal guidelines. One reviewer had several queries with regards spelling of items in the reference list. However, I have checked with the original articles and confirmed

that I've written the citations using the same spelling that the article was published with.

The concern about the lack of a conceptual framework has been addressed in the following ways:

- The information on the Theory of Assisted Performance was removed, as it focused on the role of the facilitator, which was not emphasised in the study
- I have replaced this with social constructivism as a theoretical approach, as this more effectively addresses the concept of student learning
- The above changes were also made in an attempt to add coherence between the background, aim of the study, method and discussion.

The objectives of the study were reviewed, taking into account the lack of clarity around the concepts of "evaluation", "effectiveness", "contextually-relevant" and "process". I added information that should clarify the concerns of the reviewer in some areas, and removed others. Specifically, the use of "evaluation" was probably erroneous, as the idea was mainly to determine students' perceptions of groupwork, and so was removed from the paper.

The content that students produced was evaluated against the module descriptor and was not included as part of the study. I have added a footnote that no correlations were done between the marks students received, and their perceptions of the work they did. I have removed the emphasis on the product of the assignment, and focussed instead on the process of groupwork. This emphasis was carried throughout the paper. Most references to the product of the assignment have been removed, as I realised that this component had little relevance in terms of the actual survey that was conducted. The content of the assignment was graded and feedback given to students to improve their work. However, this was not included in any way in the survey. For the purposes of clarity, these sections have been removed.

I have (hopefully) improved the Methods section by adding information that clarified the:

- graduate attributes
- role of the lecturer
- group allocation
- survey questions
- data analysis (qualitative and quantitative)
- ethical considerations

I have included some of the suggestions from one reviewer with regards additional sources of literature. These were used to develop the theme of social constructivism as an underlying framework in the paper, as

well as to add to the Discussion.

One reviewer suggested changing the presentation of the qualitative results from quotes to tables with themes and categories. I have decided not to take this approach, as I believe that the use of the quotes in their current format is sufficient to bring across the message of the paper.

I have restructured the Discussion to be in line with the Results, as per the reviewers suggestions.

Minor grammatical errors were addressed throughout the paper.

I have made minor changes to the abstract to reflect the changes to the paper.

I attempted to change the keywords to more accurately reflect the appropriate MeSH terminology. However, the MeSH browser has no results for the following keywords: groupwork, collaboration, collaborative learning, technology, social software or wiki. All of the keywords were therefore left unchanged, except that "education" was added. "Collaborative learning" was changed to "Collaboration".

Ages are now reported using the suggested descriptive statistics.

Information provided in the pie chart was changed to a narrative description.

Please pass on my thanks to the reviewers, both of whom highlighted significant shortcomings of the paper and who provided detailed suggestions on how to improve it.

Kind regards,

Michael

12.7. Appendix VII: Reviewer comments (Chapter Seven)

See below for the reviewer comments following the initial submission of *The use of assisted performance within a social network to develop reflective reasoning in undergraduate physiotherapy students*.

Reviewers' comments

Reviewer(s)' Comments to Author:

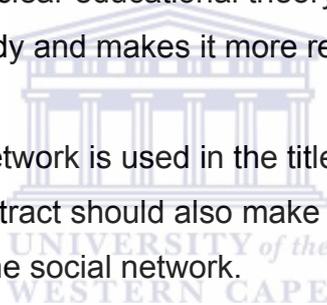
Reviewer: 1

Comments to the Author

This is a timely article about an emerging aspect of medical education that is of potential interest to the readership of Medical Teacher. The authors have used Web 2.0 technology for teaching and learning , with a clear educational theory underpinning their approach.

This is a great strength of the study and makes it more relevant to a wider audience.

I recommend that online social network is used in the title and throughout the whole article, including practice points. The abstract should also make it clear in the methods that the intervention was a facilitated online social network.



Procedure Page 6

This describes the intervention and it is essential to state that it was online and facilitated. The process of message posting should be explicitly described - I suspect it was asynchronous in a blog format, rather than discussion board.

It is unclear if the groups were across Yr 3 and Yr 4 or in separate year groups

Ethical consideration P7/8 If students had refused to participate, then the full record of the interactions would be disrupted. Did this occur?

Limitations and Recommendations P 16

It would also have been useful to obtain the student's perceptions of usefulness and usability of the process. This would help other educators to decide whether to use the approach.

Reviewer: 2

Comments to the Author

This is an interesting and unusual paper. I found it illuminating to think of online teaching and learning fora within the theoretical framework you outlined.

The main limitation of this paper is, as you have pointed out, that we don't know how this actually improved participants' knowledge or skills. Is there anything in your analysis that points to students saying how they have done things differently as a result of the online interactions?

A few more minor points: 1. The language is very specialised. I have a background in psychology, not sociology, and I found some of the sentences in the introduction extremely long and complex. I wonder if they could be put into more plain English.

2. There needs to be a clear Discussion, starting with a summary of results, rather than just launching straight into the study limitations.

Reviewer: 3

Comments to the Author

1. The paper deals with an important method in guidance of the clinical teaching. The examples of this pedagogical approach are interesting and informative, but the author describes the cases only without any comparison to an appropriate control group.
2. The declared aim of the work - to determine if a social network could be used to guide the development of practice knowledge – is not achieved, as no objective assessment of social network role in the pedagogical process is given. Again any control group and objective criteria fail.
3. I recommend either to modify the article as a short communication about the practice of University of the Western Cape in assisted discussion or to complete the

paper with an assessment of the social network role in the clinical education in comparison to results of the traditional face to face discussion.

My response to the editor

Dear [Editor]. Please see below my responses to the three reviewers.

Thank you for taking the time to review my paper, and for your feedback and suggestions to improve it. Please see below for my response.

Reviewer 1

I have used "online social network" throughout the paper, although not in every instance so as to avoid it sounding repetitive. I have also added that the lecturer facilitated engagement, in the Abstract.

Under "Procedure" I have made the process more explicit by describing it in more detail. I have also tried to clarify how the groups were arranged.

Under "Ethical considerations", if students had asked for their information to be removed, then yes, some of the interactions would have been disrupted. However, none of them asked for this. I have added a sentence at the end of the section to this effect.

I have included a sentence in the "Limitations and recommendations" section with regards the usefulness of asking about students' perceptions of the process. I do think that including a short survey after the assignment would have added some value to the results and conclusions of the study. In addition, I have added another paragraph explaining the potential usefulness of asking students to read and comment across year levels.

Reviewer 2

Unfortunately, I didn't gather any data directly from the students with regards behavioural change following the completion of the assignment. The reason for this is that student self-report is a poor indicator of actual learning or behavioural change. However, as another reviewer has pointed out, a short survey following the project could have at least ascertained students' perceptions of the process. I have included a sentence in the "Limitations" section to this effect.

I have tried to make the Introduction more accessible to a general audience by removing extraneous information and simplifying where possible.

With regards the Results and Discussion, I tried to integrate them so as to be able to discuss the result immediately and hopefully clarify the point. I have now begun each section of the Results with a statement highlighting the point I want to make, then used quotes as evidence, and then discussed those quotes in relation to other literature. I hope that this helps to make it more clear.

Reviewer 3

I agree that there was no direct achievement of the aim, in the sense that I didn't objectively evaluate any changes in students' practice knowledge. However, in order to actually do that would require a study that is way beyond what this small research project set out to achieve. This is why I attempted to create relationships between developing practice knowledge and reflective practice, which is known to play a role in the development of practice knowledge. Then I tried to demonstrate that an online social network could be used to develop reflective skills in clinical contexts. The idea is that reflection has been shown to improve practice knowledge, and that social networks can be used to develop reflective reasoning skills. I have tried to make these links more clear in the paper by placing the emphasis on reflective reasoning, rather than on the development of practice knowledge. I have also modified the aim to increase the emphasis on reflection.

I did not use a control group as this was a qualitative study using a small sample of students, making quantitative analysis difficult. In addition, the idea was not to compare one teaching approach with another (i.e. online vs face-to-face, but to determine if an online social network could be used effectively to develop reflective skills. A control group was therefore not indicated.

It is also not possible to add a comparison of a social network with face-to-face discussion, as the study was conducted during 2010 and all of the 3rd and 4th year students of that period have graduated. In addition, much has changed as far as our teaching practices are concerned, so a comparison with current students would also have little value, in the

sense that their learning process has been different to what the other cohort would have experienced.

