
Learning interactions:

A cross-institutional multi-disciplinary
analysis of learner-learner and learner-teacher and
learner-content interactions in online learning contexts

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- Professor Michael Singh, University of Western Sydney



List of acronyms

CMS	-	Course Management System
CQU	-	Central Queensland University
LA	-	Learner Analytics
LMS	-	Learning Management System
USQ	-	University of Southern Queensland
VLE	-	Virtual Learning Environment
WIR	-	Work Integrated Research

Executive summary

Learning management systems are at the forefront of the online technologies making a serious impression on patterns of learning and teaching in higher education (Coates, 2006). Learning management systems (LMSs), often referred to as course management systems (CMSs) and as virtual learning environments (VLEs), are becoming ubiquitous at universities around the world (Coates, James, & Baldwin, 2005) and, in a relatively short time, have become perhaps the most widely used educational technology in higher education (West, Waddoups, & Graham, 2006). It has been argued that, despite the LMS' increasingly profound effects on learning and teaching (Coates, et al., 2005), research into the educational effectiveness of LMSs is limited (Lopes, 2008) and is often based on assumptions about campus learning environments (Coates, 2006).

Distance education's online environments offer an educational domain unique in their potential for interaction, participation and collaboration and have been acknowledged to represent one of the fastest growing contexts for adult learning. Although the question of how learners interact in computer-mediated environments has received increasing research attention, little is known about the dynamics and processes of learner interaction and how these relate to learning in online courses. This project drew from and built upon two different studies conducted by members of the project team (Beer, 2012; Rossi, 2012). In the study, researchers from Central Queensland University and the University of Southern Queensland engaged in an action research process that utilised a collective case study design to reach cross-institution multidisciplinary understandings of the patterns, processes and consequences of learner-content, learner-learner and learner-teacher interaction in online courses.

Five cases were used to investigate the phenomenon of learning interactions in online learning management systems. Two key questions were framed as a 'way in' to that investigation: How do learners interact in online courses? and What are the patterns, processes and consequences of learner-learner, learner-teacher and learner-content interactions in these courses? For each case, data were collected from static course archives of two higher education institutions. Data analysis procedures consisted of: (a) learning management system data mining of user activities, student results and demographics; (b) content analysis of course profiles and other related course materials such as handbook entries and assessment marking criteria; (c) statistical analysis of LMS systems logs and course statistics; (d) categorical analysis according to the central tenets of grounded theory; and (e) thematic constructions of learner-learner, learner-teacher and learner-content interactions.

The conclusion from this project is that these LMS design features continue to favour learner-content interactions. Of most interest to the teaching academic is that over-emphasis on content creation and learner-content interaction to engage learners is misguided, and their time is better spent focusing on embedding in their course design interaction between learners, their peers and their teachers. Evidence from the project indicates that engagement with course content will naturally arise out of directed interaction between learners, their peers, and their teachers. However, the reverse is not necessarily the case because directed interaction with content does not engage learners with their peers, nor their teacher.

The project report findings are presented in the following chapters:

Chapter 2: a literature review (a focused account of interactions and the use of learning analytics in online environments as well as an audit of scholarly peer reviewed outputs in the field of online learning in higher education);

Chapter 3: an innovative research approach utilising mixed methods of data collection and analysis to construct cases within an action research process;

Chapters 4 and 5: a data set from which a conceptual model and a set of evidence-based curriculum development and delivery guidelines are proposed.

Based on the results of the research, a model has been constructed to explain the relationships among course design, interaction and learning in online courses and the patterns, processes and consequences of different types of interaction in online learning contexts. A set of guidelines has also been developed that identify curriculum design and delivery conditions conducive to interaction and effective learning in online courses. Further details of these outcomes are provided in Chapter 5 of this report.

Summary of findings

The pedagogical and curriculum design implications of this study are subtle, yet profound.

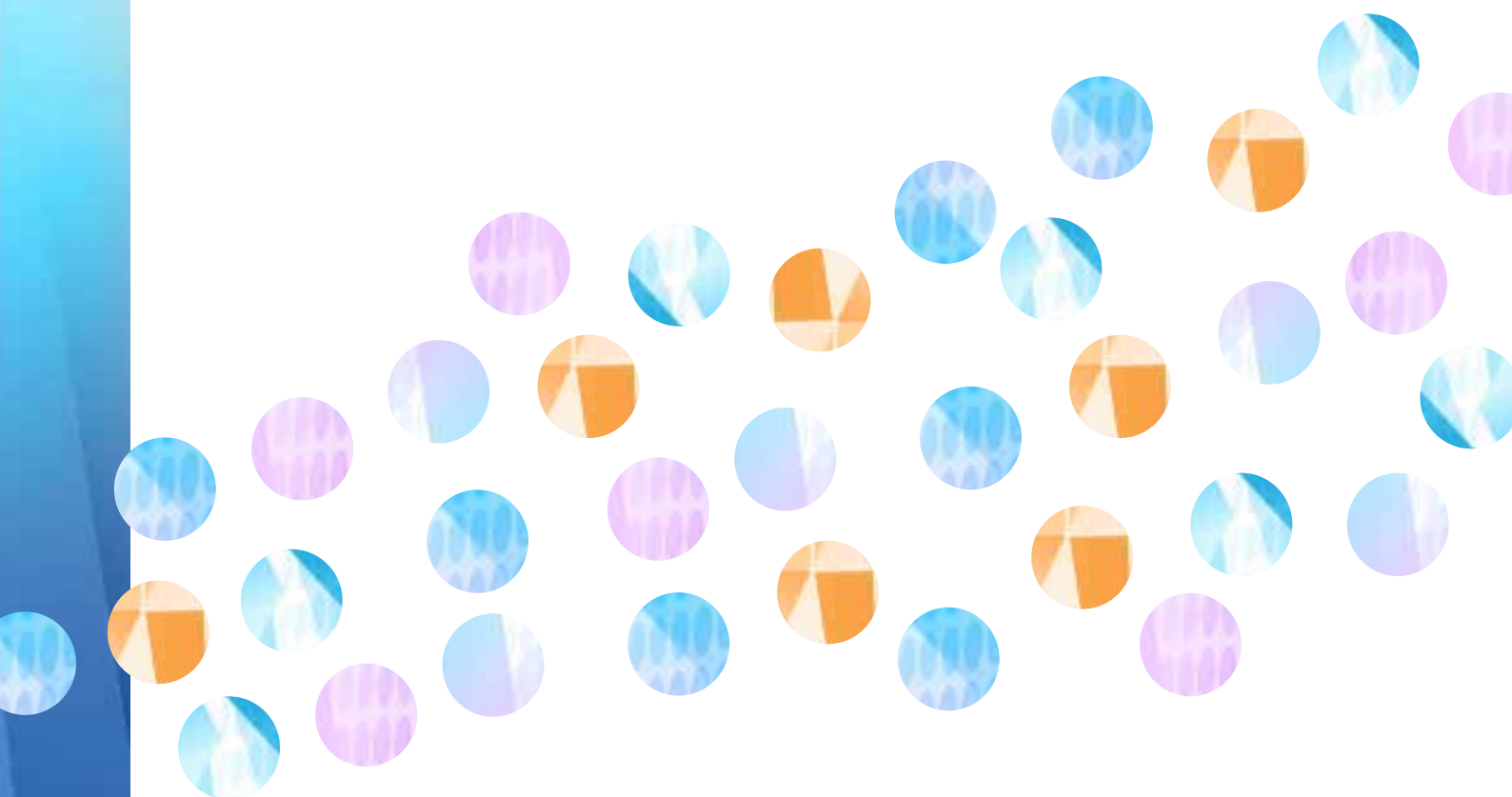
- 1 **The rate and nature of change in technology use in Australia's tertiary sector will continue to be unrelenting with profound effects on the work of teachers, 2 Research in this area is dispersed among the disciplines and divisions of institutions; and is diversely different in its theoretical and methodological orientations.**
- 3 **Pedagogical design and practices that stimulate human interaction within virtual environments, corresponds with heightened student engagement with course content.**
- 4 **It is the focus on human interaction and less so on content that results in more rounded interactivity and engagement in the course itself.**

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Achievements

Achievements up to submission of the project report include:

Updated Wiki Researcher website

http://wikiresearcher.org/DEHub_Research_Projects

Journal article published:

Rossi, D. M., Janse van Rensburg, H. M., Harreveld, R. E., Beer, C., Clark, D., & Danaher, P. A. (2012). Exploring a cross-institutional research collaboration and innovation: Deploying social software and Web 2.0 technologies to investigate online learning designs and interactions in two Australian universities. In J. Miller, M. Lloyd & A. Duff (Eds.), *Classrooms without walls/ Borderless classrooms*. Theme issue of the *Journal of Learning Design*, 5(2), 1-11.

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Chapter 1 Introduction

Twenty-first century's online environments offer interactional domains unique in pedagogical possibilities because online interactions constitute complex ecosystems of networked practices that may or may not transform themselves into knowledge. These systems “operate at the level of infrastructure, code and content to enable certain freedoms while controlling others” (Peters, 2008, p. 3). This report provides new insights into the manner in which interactions among teachers and learners in online environments that are controlled by levels of infrastructures, codes of practice and course content to both enable and constrain knowledge of their patterns, processes and consequences.

Educational research suggests that not all learners are suited to online learning when teaching and learning occur in online contexts (Horton & Osbourne, 2003). Whether this unsuitability and its consequences extend to teachers in online learning contexts is a specific question yet to be systematically explored. Blame may be attributed to university teachers who do not wholeheartedly embrace the perceived value of online learning (Allen & Seaman, 2007). This is occurring at the same time that, in the wider community, the use of the Internet has been found to be one of the most rapidly growing contexts for adult learning (Smith, 2008).

In formal education contexts such as universities, there is an already identified need to extend research into teaching and learning in online environments that is inclusive of the opportunities and challenges encountered for both teachers and learners (García Cabrero, Márquez Ramirez, Bustos Sánchez, Miranda Diaz, & Espíndola, 2008). Moreover, the inclusion of Internet technologies in education represents change at institutional and system levels: pedagogy, curriculum, policy, infrastructure, administration and governance (Moyle & Owen, 2008). Nevertheless, engaging with online environments as a unique educational domain with their own pedagogies for interaction, participation and collaboration remains a challenge (Kumpulainen & Mutanen, 2000; Ladyshewsky, 2004; Leasure, Davis, & Theivon, 2000; Oliver & Herrington, 2003).

Continuous technological innovation creates an inexorable need for knowledge and new skills (Hodgins, 2000); necessitating ongoing skills acquisition for proficient engagement with Internet-mediated, online learning interactions. Integral to such acquisition is the complex problem of developing continuously-evolving appropriate pedagogical strategies to accommodate not only the needs of students in online contexts (Bell, et al., 2002), but also the capabilities of teachers and/or designers to create online educational relationships through which learning may be achieved.

1.1 Background

The proposition that learning can best be improved by those engaged in it was central to the execution of this project. This proposition was investigated at two levels: the research team's learning about the conduct of education research; and the findings that provide new insights into ways of using technologies to improve the conditions for online learning. This means that the relationships between students and teachers (course coordinators, lecturers, tutors and/or markers) are central to the learning process. In many cases, specialist course designers were also involved at various stages of course development and delivery. The purpose

of this project was to: (a) develop a research orientation to an evolutionary conceptualisation and conduct of this project that would engage a cross-institutional, trans-disciplinary team of education researchers; (b) extend earlier work in this field by conducting a systematic enquiry into the technologically mediated interactions of online course delivery; and (c) construct understandings of and insights into the central relationship of education; teaching and learning.

The project has drawn from and built on methodologies and findings from two previous studies conducted by members of the project team (Beer, 2010; Rossi, 2010). Beer's study utilised the notion of complex adaptive systems (Rouse, 2000) as a framework to develop new measures for the investigation of learner engagements in online environments. Beer's study was part of a larger project developing learning analytics to examine the adoption of learning management system (LMS) features, and staff and student engagement with online courses (Beer, 2010; Beer, Jones & Clark, 2009). There were some limitations to the research, but the findings suggest that an analysis of LMS data in conjunction with student results can be used to provide the institution with benchmark information and indicators of student engagement within online courses. Rossi's study utilised a social constructivist approach to investigate the dynamic interdependence of social and individual processes in knowledge construction, because learning is recognised as the appropriation of socially-derived forms of knowledge that are internalised over time and transformed in idiosyncratic ways during the appropriation process (Merriam, 2009). Vygotsky's (1978) theory of learning and development was relevant and of value in the analysis of learner-learner interactions in that study.

A macro level research and development priority of the DEHub consortium has been to foster innovation in research methods in distance education and knowledge transfer. This project addressed that priority through a research approach that has also addressed three other DEHub research priorities:

- **Interaction and communication in learning communities (Priority 7)**
- **Professional development and faculty support (Priority 4)**
- **Curriculum design (Priority 6)**

From this list, the primary priority area addressed by this project is that of 'interaction and communication in learning communities'. This priority was explored in two contexts; interactions and communications in the project's research learning community across two universities, different disciplines and diverse research backgrounds; and analysis of the interactions and communications among the five project case studies. The analysis also addressed two other priorities; namely, curriculum design, as well as professional development and faculty support: these are both reflected in the model and guidelines for teaching and research in online learning management systems developed in this project.

1.2 The project

In this project, researchers from two universities (Central Queensland University (CQU) and the University of Southern Queensland (USQ)) oriented their work within three cycles of action research. In this iterative process, they constructed five case studies to discern patterns, processes and consequences of online interactions. There were two entry-level questions:

1. **How do learners interact in online courses?**
2. **What are the patterns, processes and consequences of learner–learner and learner–teacher interaction in online contexts?**

To address these questions, the research incorporated a mixed methods approach to ensure data capture and analysis across institutions, multidisciplinary understandings of the learner-content, learner-learner and learner-teacher interactions.

For the higher and tertiary education sectors, both nationally and internationally, this project is significant. It builds on the knowledge base of the research team, which has been peer-reviewed and published. In so doing, it provides an example of a successful cross-institutional, multidisciplinary research collaborations among education researchers in rural and regional communities.

1.3 Overview

This report provides an account of the conduct of the research and its outcomes. It is presented in six chapters, each of which addresses particular project outcomes:

- A critical review of interactions in course designs that are both conducive to and effective for teaching and learning in online university courses (Chapter 2).
- A collaborative research partnership between CQU and USQ (Chapters 3 to 6).
- a set of evidence-based curriculum development and delivery guidelines that will enhance online teaching-learning relationships in online university courses (Chapter 5).
- A conceptual model to illustrate and explain the role of teaching-learning relationships in online interactions and knowledge construction in university courses (Chapters 5 and 6).
- Scholarly outputs that will contribute positively to the research and publication quantum of both institutions and the DEHub consortium (Chapter 6 and Reference list).

Throughout these chapters that follow, readers will discern the recursive cycles and reflexive dynamics that constituted the enactment of this project. This too was a learning process that did not reduce differences but was rather enhanced by them, together with the similarities that shaped its own complexity (Alhadeff-Jones, 2008).

Chapter 2 Online Interactions: a review of the literature

Introduction

The notion that interactions between teachers and learners is fundamental to the education experience is not new, and nor should it be. Research shows that such interactions differ between when slate and chalk is the primary interaction technology and when the digitised tools of online environments, diverse differences among such interactions have been reported in the literature. Throughout the world, education is in “a state of flux as it draws upon an increasingly powerful mix of media and technologies” (Daniel, 2010, p. vi). Government policies have placed increasing emphasis on blended and online teaching and learning models, with universities allocating considerable financial investments in online infrastructure and curriculum design and delivery in recent times (Australian Government, 2008; Kilpatrick & Bound, 2002; Latchem & Jung, 2009). These factors, together with the complex conceptual challenges of pedagogy’s multiple theoretical and practical perspectives, have had significant impacts on teaching and learning (Leach & Moon, 2008).

Current distinctions evoked by terms such as “distance education” and “face-to-face delivery” have been superseded by technologically-mediated interactions that blur the boundaries between what may now be considered these redundant terms in education. The pedagogical ramifications of this are of concern to individuals (teachers and learners), and collectives (educational institutions and systems). In addition, from a curriculum perspective the construction of knowledge is now experienced in different ways as it is mediated through and among different technologies (Osberg, Biesta, & Cilliers, 2008).

In this chapter, we review the literature in four sections, which reflect major issues emerging from a focused analysis of interactions in online environments:

- **From distance education to online learning**
- **Conditions for online learning**
- **Interactions in online learning**
- **Interactions in online learning management systems.**

2.1 From distance education to online learning

Much of the early research on distance education and, in later times, online learning, sought to demonstrate that online contexts could deliver equivalent outcomes for student achievement when compared to “traditional” that was face-to-face, synchronous, classroom-based delivery education modes (Simonson, Schlosser, & Orellana, 2011). On the surface, the research showed that “as long as the quality of instruction delivered over distance was as good as the quality of traditional education, there would be no significant differences in learning between them” (Swan, 2003, p. 3). However, as the body of work developed towards theoretical frameworks and methodologies for exploring and explaining how to deliver education, it became clear that

online and traditional contexts for learning were fundamentally different in nature, and that developing educational practices for online learning had to be based on an understanding of this difference.

Both learners' and teachers' sense of place(s), their establishment of conditions conducive to interactively sharing experiences and their knowledge construction activities have the potential to be impacted by paradigmatic change (Swan, 2003). Online learning has particular affordances derived from this difference, and the implications for differences in research designs are also emerging:

The distance education research agenda has ... evolved. The focus has shifted to a more learner-centred approach. Researchers are not merely looking at achievement but are examining learner attributes and perceptions as well as interaction patterns and how these contribute to the overall learning environment (Simonson, et al., 2011, p. 139).

Quality in online learning is now understood to involve the interplay of a range of contextual and conditional nuances, which operate differently from those in traditional educational contexts (Swan, 2003). Thus, current online learning literature has moved on from the position of "no significant difference" to emphasise that online distance education has the capacity to elicit student learning in new and powerful ways. "More recently, innovative studies have looked ... specifically at particular cognitive skills, and these sorts of studies are hinting at particular affordances and constraints for learning online" (Swan, 2003, p. 5).

In those cases where the affordances of online learning environments are well-understood and thoughtfully mobilised to align with desired learning outcomes, there is potential to reach more students and afford them with a wider range of educational outcomes (Picciano, 2002; Simonson, et al., 2011; Swan, 2003). Research into online learning has begun to map the effects and interplay of the factors, which determine how such affordances are realised (Swan, 2003).

2.2 Conditions for online learning

Conditions for online learning occur across three main dimensions: interactions, materials and activities (Means, Toyama, Murphy, Bakia, & Jones, 2009). These dimensions may be understood in terms of the variables they contain. That is, whether the educational course in question is conducted using:

- **Synchronous or asynchronous interactions, or a combination of both**
- **Textual, visual, aural or multimedia based materials**
- **Group versus independent based activities, or a combination of both**

These are among the course design aspects that create the observable environment for learning and their relative merits are dependent on the desired types of learning behaviours and educational outcomes for students (Means, et al., 2009). Although these aspects are important for course delivery, the intervening conditions to which online learning is subject are also important. No matter which of these conditions are in operation, there are more detailed intervening conditions, which also have an effect on outcomes.

2.2.1 Intervening conditions

As with “traditional” face-to-face education, course design and structure are the principal conditions which determine how online learning takes place and with what consequences. Swan (2003) summarises the findings of four studies that examined which course design conditions affected learning outcomes. There is a general consensus across these studies on the elements which are most significant:

- The degree of active versus passive learning activities;
- The amount of flexibility and variety in how the course is presented and under taken;
- The nature, frequency and quality of feedback;
- The clarity and explicitness of goals or expectations, and;
- The amount and nature of contact and guidance provided by teachers.

Swan (2003) argues that these conditions do not differ significantly from ideal course design in face-to-face education. This argument is supported by educators such as Ramsden (2003) and Biggs (2003). However, Swan (2003) contributes findings from her own research which suggest that the degree of structure, transparency and communication potential of course design are more significant for online learning than traditional learning because of their effect on the negotiation of meaning:

[Because] real-time negotiation of meaning is impossible among instructors and students separated by space and time, clarity of meaning is more important in online classes. Consistent, transparent and simple course structures add to such clarity as well as insure that learners only have to adapt to such structures once. (Swan, 2003, p. 7)

Therefore the effects of each of these elements of design are expected to be substantially different in online learning than traditional contexts.

Each of the elements of course design mentioned above is connected to the interactive potential or interactivity that an online course enables. Although a number of studies have examined the concept of interaction, there is a lack of definitional consensus (Beuchot & Bullen, 2005). Confusion appears to arise because the term “interaction” is often used interchangeably with “interactivity” (Rossi, 2010). Su, Bonk, Makjuka, Lui and Lee (2005) differentiate between the two terms, suggesting that interaction is process orientated and concerned with dynamic actions, while interactivity is feature orientated and emphasises system characteristics or the degree of interaction. Thus interactivity could be interpreted as the level of participation. The question of how learners interact in online learning situations has received increasing research attention (Strijbos, Martens, & Jochems, 2004).

Thus, interaction has become the primary focus of much of the literature on online education and is a central concern for understanding how to realise the affordances that online learning may offer, such as;

- **Further elaboration of intervening conditions for course design**
- **Effects of intervening conditions in different types of online learning environments**
- **Relationship(s) between intervening conditions, designed (and desired) learning outcomes and online interactions.**

2.2.2 Contextual conditions

People and technologies will both impact on the contextual conditions shaping online learning now and into the future. Young and Sax (2009) found that when teachers take into account learners' social backgrounds and demographic profiles, positive interactions between students as learners and teaching staff enhance learning experiences and educational outcomes. In instances where teachers were aware of the ways in which their students were experiencing their online conditions of learning (for example, the intervening conditions), the potential for positive interactions was also enhanced (Mancuso, Desmarais, Parkinson, & Pettigrew, 2010).

Contextual conditions shaping online learning interactions are not limited to recognising the individual differences of learners. Teachers' choice of curriculum and pedagogy infuses the design of courses and the programs in which they are embedded. Finally, the day-to-day experiences of living that impact variously on how, when and where online learning environments are accessed are significant features of these contextual conditions.

In addition, technological challenges and trends impact the contextual conditions of online learning. Emerging "new horizon" trends have been ranked in order of their potential impact on teaching, learning, research and information management:

- **Mobility:** People expect to be able to work, learn and study whenever and wherever they want.
- **Personalising learning:** Increasingly, students want to use their own technology networks for learning;
- **Technology infrastructures:** The growing availability of bandwidth will dramatically change user behaviours in teaching, learning and research over the next five years. The technologies will be increasingly cloud-based, with decentralised IT support;
- **Curriculum design and delivery models:** Education paradigms have already shifted to include notions such as blended learning, online learning, hybrid learning and collaborative models;
- **Pedagogy - Educators' roles:** The abundance of resources and relationships made easily accessible via the internet is increasingly challenging the roles of educators;
- **Evaluation metrics of academic work:** What were previously thought of as new and disruptive forms of scholarship are now becoming the norm for scholarly communication (for example tweets, blogs, open textbooks, electronic journals). There is also an increasing interest in using data for personalising the experience of teaching performance Measures.

(Johnson, Adams, & Cummins, 2012, pp. 17-18)

These conditions frame the interactions that are central to the educational experience in online learning environments as “new terminology (virtual, open, distributed and distance education), new technologies, new program demands, new audiences, and new commercially competitive providers” (Garrison, 2000, p. 1) jostle in discursive and conceptual contestations.

2.3 Interactions in online learning

Interactions have been defined in a pre-online learning age as “reciprocal events that require at least two objects and two actions [and they] occur when these objects and events mutually influence each other” (Wagner, 1994, p. 8). The focus on interactions in online learning emerges from the potential and properties of new technologies to support sustained and educationally purposeful communication (Garrison & Cleveland-Innes, 2005, p. 133).

Existing research on interaction tends to focus on three main types as significant in the realisation of learning outcomes in online environments (Bernard et al., 2009; Miyazoe & Anderson, 2010; Rhode, 2009; Swan, 2003). These types of interaction are:

- **Learner-content interaction;**
- **Learner-learner interaction, and;**
- **Learner-teacher interaction.**

Interaction has long been considered a defining and critical component of the educational process, notwithstanding its conceptual dilemmas (Anderson, 2003a, 2003b). Online interactions are unusually complex because it is computer-mediated and tends to be heavily text-based and time dependent (Gunawardena, et al., 2001); text assumes the fundamental form of exchange, representing the dialogue and interaction between communicators. While some researchers are of the view that online contexts create a unique social climate that impacts interactions and group dynamics (Gunawardena, et al., 2001), others maintain that two-way interaction is not an inherent part of technology, arguing that interaction and learning might not occur at all if the social structure of the course only requires passive compliance. This argument suggests that the results of learning interaction may be tied to the instructional design of the course (Chou, 2002).

Anderson (2008) offers a model of online interaction in which learner-content, learner-learner and learner-teacher interaction can be substituted for each other without decreasing the quality of the resulting learning. He claims that ‘sufficient’ levels of deep and meaningful learning can be developed as long as one of these three forms of interaction is at a very high level. In such cases, the other two forms of interaction may be offered at a minimal level or eliminated without degrading the educational experience (Anderson, 2003a, 2003b). In this reasoning, the challenge for teachers and course designers is to construct learning environments that are “simultaneously learner-centred, content-centred, community-centred and assessment-centred” (Anderson, 2008, p. 66). This model provides a potentially useful point of departure for this project.

2.3.1 Theorising interactions

Anderson's ongoing work (1998, 2003a, 2003b; Miyazoe & Anderson, 2010), based on his "Interaction Equivalency Theorem", posits that:

... deep and meaningful [online] learning is supported as long as one of the three forms of interaction (learner-content, learner-learner, learner-teacher) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience. (Miyazoe & Anderson, 2010, p. 94)

In Figure 2.1, Miyazoe and Anderson (2011) propose two theses of interactions in online learning that are based upon Anderson's (2003a) earlier theory building work:

Thesis 1. Deep and meaningful formal learning is supported as long as one of the three forms of interaction (student-teacher; student-student; student-content) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience.

Thesis 2. High levels of more than one of these three modes will likely provide a more satisfying educational experience, although these experiences may not be as cost- or time-effective as less interactive learning sequences

(Miyazoe & Anderson, 2011, p. 1)

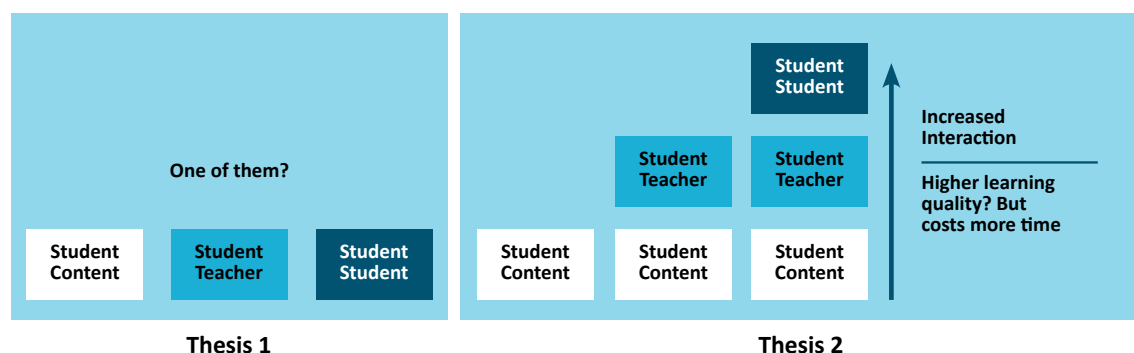


Figure 2.1: Visual representation of the equivalency theorem by Anderson (2003a)

Miyazoe and Anderson (2011) report that, so far, research has examined only Thesis 1 in detail. At this stage, the time and cost of Thesis 2 have not been examined and any outcomes of such examination are going to be significant because "if, in reality, doubling or tripling the interaction dyads brings little or no improvement in the quality of learning, it would be much wiser to concentrate on pursuing the mechanism of Thesis 1" (Miyazoe & Anderson, 2011, p. 4).

The interactions equivalency theorem has been used by researchers around the world as online learning technologies have evolved. Findings have now shifted perspectives beyond the original three dyads (Anderson, 2003a) of the student's perspective; that is, student-teacher, student-student and student-content relationships. The roles and relationships of teachers (teacher-teacher, teacher-student, teacher-content), and content (content-student, content-teacher, and content-content), are now also emerging as significant considerations. Thus two further theses are now proposed:

Thesis 3: Deep and meaningful formal teaching is supported as long as one of the three forms of interaction (teacher-student; teacher-content; teacher-teacher) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience.

Thesis 4: Deep and meaningful formal teaching and learning are supported as long as one of the three forms of interaction (content-student; content-teacher; content-content) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience.

(Miyazoe & Anderson, 2011, p. 1)

The positioning of content as an actor in this electronically networked learning is significant because it heralds the emergence of smart content aggregation and navigation (SCAN) technology that is already developing software to combine semantic integration with natural language processing. Furthermore, current evolution in natural user interfaces, smart objects, gesture-based computing and an “internet of things” (Johnson, et al., 2012, p. 2) will provide further challenging insights into the theorisation of interactions in online learning - and teaching.

Considering this argument, it is important to be clear about the objectives of research into online learning interactions. If the aim is to produce courses and curricula that afford some learning with a minimal strain on resources, the theoretical frameworks of relevance will be very different from those that are necessitated by a focus on the optimisation of learning outcomes for online learners.

Anderson’s standpoint on interaction equivalency argues that “different economies exist between independent-oriented and interactive-oriented learning strategies and activities, and that these need to be taken into consideration when designing and delivering distance education that meets the diverse needs of learners in an effective and efficient way” (Miyazoe & Anderson, 2010, p. 94). This statement may be interpreted to mean that, in learning environments where the focus is on independent learning by students, only learner-content interaction is important for achieving “deep and meaningful learning” (Miyazoe & Anderson, 2010, p. 94).

Although Miyazoe and Anderson (2010) argue that a number of research studies support the Interaction Equivalency Theorem (including Bernard, et al., 2009; Miyazoe, 2009; Rhodes, 2008, as cited in Miyazoe & Anderson, 2010), there is a broad range of literature and meta-analyses which take issue with its fundamental assumptions. For example, Swan (2003) argues that “none of the three modes of interaction function independently in practice. ... A useful way of thinking about the three forms of interaction is provided by Rourke, Anderson, Garrison & Archer’s (2001) ‘community of inquiry’ model of online learning” (Swan, 2003, p. 4).

Swan (2003) theorises that the different forms or types of interaction may be equated to the different types of presence. The optimal affordances of interaction are realised in the ways that the types of interaction overlap, as in the segments of the Venn diagram shown in Figure 2.2.

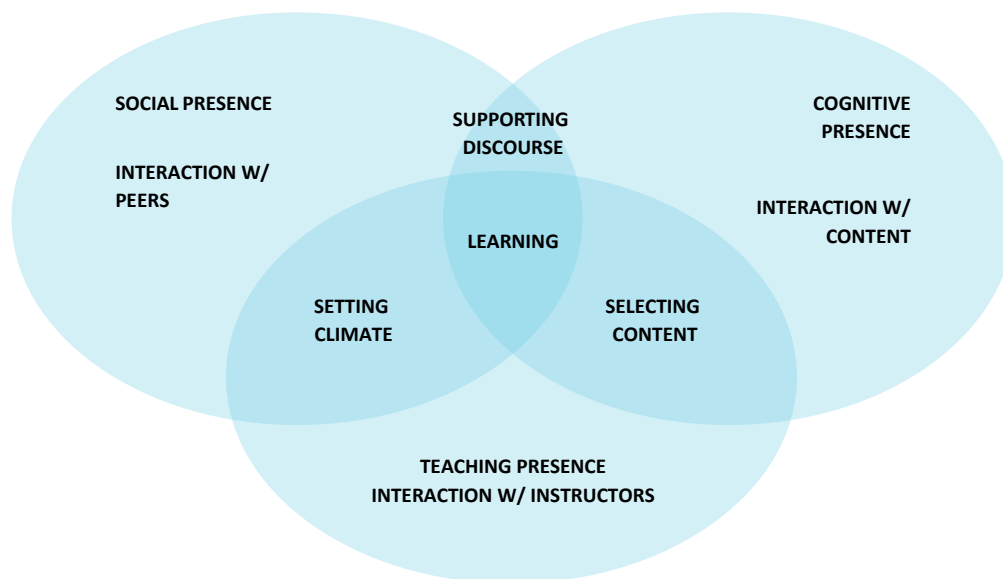


Figure 2.2: Swan's (2003, p. 4) adaptation of the Community of Inquiry model, describing the mutually reinforcing significance of each type of interaction

Like Swan, Garrison and Cleveland-Innes (2005) argue that it is through the convergence of these domains that the potential of online interactions for learning is realised. Online learning requires a community of inquiry (Swan, 2003), which is constituted by the social presence of interactions among learners, and interactions with the teacher as well as a cognitive presence afforded by learners' interactions with the content knowledge. Thus, informed reflective practices become integral to a community of inquiry, which is:

the integration of cognitive, social, and teaching presence. Considered together, the three presences address the qualitative nature of interactive inquiry consistent with the ideals of higher education. (Garrison & Cleveland-Innes, 2005, pp. 134-135, 144)

In this explanation of how interaction is significant for creating deep and meaningful learning, it is the interplay and mutual reinforcement among the different types of interaction that allow learners to achieve higher-order thinking and critical engagement with what they are learning. This theory is in direct disagreement with Anderson's (2003a, 2003b) theorem.

2.3.2 Nature of Interactions

The integrated approach proposed by Swan (2003) and Garrison and Cleveland-Innes (2005) is dependent on establishing the equivalency of the types of interaction with the types of presence. This means that social presence may be equated with learner interactions; cognitive presence may be interpreted through content interactions; and teacher presence can be depicted by teacher interactions.

This equivalency is itself dependent on the nature and quality of the interactions themselves. Ensuring a certain quantity of interaction in itself is not enough. It is in the quality and appropriateness of the nature of interactions—interactions conducted purposefully for learning—that each type can be equated to cognitive, social and teaching presence respectively, as acknowledged by Swan (2003).

Garrison and Cleveland-Innes (2005) claim that the quality of interactions can be determined by the extent to which they influence thinking as critical and reflective in its practice, rather than surface level exchanges of information. As such, quality interactions must be structured, directed and purposeful, involving a depth of engagement with both the content and other actors in the learning environment, if the interactions are to be meaningful for the learning. However, this notion, in itself, can be deceptive:

Meaningful engagement does not simply correspond to sending lots of messages. It may mean that a student is engaged vicariously by following the discussion, reflecting on the discourse, and actively constructing meaning individually. Ideally, interaction would be required to confirm understanding. However, students may be cognitively present while not interacting or engaged overtly. (Garrison & Cleveland-Innes, 2005, p. 144)

This reveals another challenge for researchers investigating the quality of online learning interactions, because it confirms that further work is required if silent engagement within interactions is to be understood (Amundrud, 2011).

Teacher presence has been found to be the most significant factor for achieving meaningful online learning interactions (Garrison & Cleveland-Innes, 2005). This teacher presence requires performance of a variety of communication functions (Swan, 2003). A number of studies have labelled such functions slightly differently; however, each is sufficiently analogous to “managerial, social and intellectual” communication (Swan, 2003, p. 12). This accords with Anderson, Rourke, Garrison and Archer’s definition that teaching presence is “the design, facilitation, and direction of cognitive and social processes for the purpose of realising [students’] personally meaningful and educationally worthwhile outcomes” (2001, p. 5). The significance of teaching presence for meaningful interactions has been empirically verified.

As already noted (Mancuso et al., 2010), there is considerable literature indicating a relationship among teaching presence, perceived learning and the nature of that learning (Garrison & Cleveland-Innes, 2005; Picciano, 2002; Swan, 2001). Swan (2001) concluded that interaction with teachers “seemed to have a much larger effect on satisfaction and perceived learning than interaction with peers” (pp. 322-323). Similarly, Wu and Hiltz (2004, p. 149) stated that the teacher’s role is crucial to effective online learning and “more structured discussion topics and considerable time devotion are required” of teachers. Finally, Hay, Hodgkinson, Peltier and Drago (2004) found, in a study comparing online and traditional courses, that learner-teacher interaction was a stronger predictor of learning effectiveness than learner-learner interactions.

Such findings demonstrate that, while the interplay of all types of interaction is important if students are to adopt a deep approach to learning, it is the role of the teacher in interaction which transforms these elements into the all-important community of inquiry. However, if the requisite intervening conditions of course design (discussed earlier) are not ideal (as in the case above), appropriate and sufficient interaction cannot realise the affordance that the online environment would otherwise offer.

While there may be significant differences between interactions in online synchronous and asynchronous learning environments and those in face-to-face synchronous interactions, there remains a common understanding in the notion that interactions are effective if they impact

positively on learning. Such positive impact may be demonstrated through the articulation of complex conceptual knowledge, and critical discourse (oral and/or written depending on the medium within the online environment). Empirical studies suggest that there may be a significant difference between online and traditional contexts in terms of the learning and cognitive behaviours that they tend to promote in students:

Spiro's research on learning from hypermedia found that students who explored complex topics from multiple perspectives through hypermedia programs scored higher on measures of complex understanding than students presented with similar material through a traditional (linear) CAI format. Thus, online environments might be particularly supportive of the development of literary understanding, divergent thinking and/or complex conceptual knowledge. (Swan, 2003, p. 9)

Significant differences in scores between traditional and online students for technical versus conceptual aspects of assessment were also identified when students in traditional contexts scored more highly in technical aspects of assessment, while online students scored more highly in conceptual aspects (Parker & Gemino, 2001).

Students who were highly interactive during an online course scored better on a written assignment than less interactive students (Picciano, 2002). The higher written assignment scores of the more interactive students were attributed to their greater ability to integrate multiple perspectives—an ability Picciano (2002) suggests they may have developed through their extensive interaction with other students' points of view in the course discussions. Such interactions are inclusive of learner-to-learner, learner-to-teacher and learner-with-content.

These results demonstrate that instruments for measuring student learning outcomes can be misleading. Taken as a whole, the assessment scores of students in these courses would not have indicated a significant difference in how students were learning or to what level. It is important, therefore, to consider exactly what is being measured by a given instrument—in terms of the processes and cognitions—that students undertake, not just the assessment-based outcomes that they achieve. A further point for consideration came out of Means, Toyama, Murphy, Bakia and Jones (2009) sizable meta-analysis of evidence-based practices in online learning:

In many of the studies showing an advantage for online learning, the online and classroom conditions differed in terms of time spent, curriculum and pedagogy. It was the combination of elements in the treatment conditions (which were likely to have included additional learning time and materials as well as additional opportunities for collaboration) that produced the observed learning advantages. (Means, et al, 2009, p. xvii)

This finding supports the contention that the elements of online learning (contextual conditions, intervening conditions and interactive conditions) interact to produce whatever consequences of the learning may be observed.

2.4 Interactions in online learning management systems

Interactions may be identified for research purposes through the “backend” data bases of learning management systems (LMS) as well as through the more qualitatively oriented processes of document analysis. Research to date has provided evidence of an underutilisation of the data

able to be mined from LMSs such as Blackboard™ and Moodle™ (Beer, 2010; Beer et al., 2009; Malikowski, Thompson, & Theis, 2007). Mined judiciously, such data may be used to inform a critical review of pedagogical practices (Dawson, Heathcoate, & Poole, 2010). It can provide hit counts, resource utilisation, discussion participation and other LMS features that support student engagement.

Previous work undertaken by Heathcoate and Dawson (2005) and Malikowski et al. (2007) used LMS data mining to supplement qualitative course evaluation responses. The argument for complementary quantitative and qualitatively informed data-driven educational decision-making is not new in these contexts. However, Berg, Maijer, and Benneker (2004) found that most research studies into these complex interactions and their potential for knowledge construction do not explicitly incorporate the data mined from using the Internet-based LMS. Recent work undertaken by Dawson and McWilliam (2008) into this process of learning analytics, as it is now more commonly known, found that the challenge for university academics is to interpret these data readily and accurately, then translate such findings into improvements in teaching practices. Such work is not without its concerns, namely: the use of learning analytics for academic staff performance monitoring; ownership and availability of academic analytics data; and ethical considerations of data collection and its monitoring (Wel & Royakkers, 2004).

However, learning analytics may offer hope for the early identification of students ‘at risk’ of ‘dropping out’ from the fully online learning experience, which may be due to the isolation and motivation issues they experience when studying via an LMS (Coates, James, & Baldwin, 2005). Such data may also be used to indicate to students what their respective individual rates of activity are in comparison to their peers in the current term and previous offerings of the same course (Purdue University, 2009). Yet a caveat is important; if this is the only measure of student engagement, then the degree to which students use an LMS (Caruso, 2006) may be as useful to teachers as the historical claims that calculate physical presence as a simple metric for determining face-to-face student engagement in learning (Douglas & Alemanne, 2007).

Notwithstanding the caution, research evidence shows that the rates of attrition for students studying online can be 20-50 per cent higher than for students studying in on-campus, face-to-face modes (Dawson, et al., 2009). LMS technology can track and store vast amounts of information on students’, teacher/s’ and course designer/s’ behaviours (Heathcoate & Dawson, 2005), but the nature of the data is basic and course coordinators, lecturers and tutors are unlikely to gain many useful insights to help them review ongoing interactions critically during a current teaching term or semester. Further research in this area may complement ongoing investigations into the ways in which students and teachers use online learning environments to co-construct knowledge in university courses. The following details the journey of a learning analytics project that aims to investigate the ways in which students and teachers are using the online environments.

Beginnings of the Indicators project

The Indicators project is a project based on analytics that aims to build on and extend prior work in the analysis of usage data from Learning Management Systems in order to identify further opportunities for research, and be used to help inform decision-making of teaching staff, management, support staff and students (Beer et al. 2009).

The Indicators project had a modest and accidental genesis. The motivation for delving into the undercarriage of the LMS was derived from the desire to streamline and automate routine tasks associated with instructor support and LMS course site creation. Two of the founding members of the project, David Jones and Colin Beer were responsible for providing support to academic teaching staff in their use of the institutional LMS for CQUniversity, which at that time was BlackboardTM. The organisational unit in which they worked had budget cuts that reduced the number of support staff. This meant that to continue to provide quality support service to academic teaching staff, more efficient approaches were necessary. Some of the routine problems that arose at commencement of term were raised by academic teaching staff as separate support requests, and as such were reactively addressed in an ad-hoc way. Taking a pro-active approach, Jones & Beer were investigating the undercarriage of BlackboardTM to identify some of these routine problems and resolve them before academic teaching staff needed to report them. Sadly, an organisational restructure saw the responsibility for support of BlackboardTM shift to the IT department, and these optimisations in staff support were never implemented. However, the discoveries that were made by ‘looking under the hood’ so to speak, kick-started the Indicators Project on its journey of examination into LMS usage across institutions, platforms, and time.

The third founding member of the project, Ken Clark was interested in investigating “... discrep[an]cies in his pedagogical (student focused/social aspect of learning) approach and his online usage (content focused). Through a Master’s project looking at improving his online user behaviour, utilising Gonzalez’s (2009) two broad approaches to teaching, what he classed as “informative/individual learning focused” and “communicative/networked focused”, Clark hopes to improve understanding of the way that academics use LMS and what this can indicate about teacher/student contact” (Beer, et al., 2009). Clark co-founded the Indicators project with Jones and Beer in 2008.

What was somewhat unique about the context in which the Indicators Project was born was that the home institution, CQUniversity, had, for whatever reason, retained usage data for their LMS systems for their entire life spans. Usage data for BlackboardTM spanned from 2004 to 2009, at which time MoodleTM was implemented to replace both BlackboardTM and a “home-grown” LMS called Webfuse. Usage data for MoodleTM has also been retained since its implementation. Furthermore, Jones and Beer came from a technologist background and possessed the necessary skills to mine the LMS databases and all three members had local contextual knowledge of the institution and of online pedagogy to analyse the data. Together, these factors provided an optimal environment for the Indicators project to flourish.

Early examination of the usage patterns of students within BlackboardTM at CQUniversity revealed a startling and exciting trend—the more often a student clicks links within the LMS, the better results they achieve. While the variation in this data was high, the sample size of almost 100,000 distance students meant there was no denying the significance of this finding. This trend was also evident from the MoodleTM usage patterns. This motivated the research team to continue analysing the data to unearth other possible trends.

With both the BlackboardTM and MoodleTM LMS, all information is located within a database, including an audit log of all usage activities of all users within the system. This audit log, along with other elements of the database, were mined and aggregated to identify a range of trends in LMS usage. Other sources of data have also been mined—such as student results—and aggregated, building a repository of information about how learners and teachers behave in a LMS.

Gaining and retaining ongoing access to this usage data has met with internal political and organisational barriers. There are philosophical debates about who, within an institution “owns” the data. Notwithstanding, the project was able to proceed and various papers have been published from the work (refer to <http://indicatorsproject.wordpress.com/publications/> for details). The project is currently examining the potential of analytics to contribute to the early identification of students who may be at risk of failing. This addresses the strategic goals of educational institutions to minimise student attrition by providing interventions and support far earlier than is currently being achieved.

Interaction within an online LMS is complex and there is recognition of the need to determine the critical factors related to interaction in online learning environments (Dennen, Darabi & Smith, 2007; Fahy, 2003). Generally Moore’s (1989) typology of learner interaction is referred to in the literature, but there are other categorisations that describe academic, collaborative and interpersonal interaction in online learning management system contexts (Jung, 2001). Criticism has, however, been levelled at Jung’s work as it does not indicate who engaged in these types of interactions (Dennen, et al., 2007); or the consequences of these interactions. While one may assume that learner-teacher interaction leads to better learning outcomes (Anderson, 2008; Dennen, et al., 2007), various studies have shown that this may not be the case (Dennen, et al., 2007).

Summary

It is clear from this focused analysis of the literature that interactions within online LMSs need to be designed and structured as mindfully as learning in any other context. However, their design and structure must account for fundamental differences in how learning happens in online LMS contexts, if it is to be as successful as possible.

Online learning has been shown to afford particularly desirable outcomes if it is designed according to known principles such as:

- **Active learning activities**
- **Flexibility and variety**
- **Clarity of goals and expectations**
- **Significant contact with and guidance by teachers (instructors, tutors, lecturers).**

Courses delivered from within online LMSs must have consistent, transparent and simple structures to allow students to engage with them effectively. In establishing such conditions, online LMS environments have significant potential for meaningful interaction, which, in turn, generate particular outcomes if the interactions are of a certain quality. This quality is understood to require: relevant substance, structure and a clear purpose. The learning engagements online should be scaffolded, systematic, sustained, reflective and critical. Such interactions have been found to come about when three types of presence are experienced by participants in the environment: social, cognitive and teaching presence. The combination of these types of presence allows for the creation of:

- **Complex conceptual knowledge**
- **Integrated perspectives**
- **Critical discourse**
- **Divergent thinking**
- **Written argumentation.**

These are desirable outcomes in all learning contexts, and especially pertinent for university learning and teaching undertaken through online learning management systems.

Emerging areas of research such as learning analytics provide different ways of harnessing advances in “data mining, interpretation, and modelling to improve understandings of teaching and learning, and to tailor education to individual students more effectively” (Johnson, et al., 2012, p. 6). The limitations of these quantitative measures may be ameliorated through more finely-grained and nuanced readings of interactions in these online learning management systems. It is this proposition that is explored further in the following chapter.

Chapter 3 Research Approach

There are problems in conceptualising and researching the complexity of interactions in and through online learning management systems (LMSs). People and their technologically mediated practices are not only idiosyncratic but also context dependent in their enactments of differences. The complexity of such interactions highlights the inability to know and name all aspects of interactions in terms of their patterns, processes and/or consequences for learning and teaching. Furthermore, interactions are “multiple, and multiply connected, and it is the multiplicity of the interactions through time that produces effects” (Haggis, 2008, p. 167). Thus it is the effects of interactions, and only some of these effects, that can be identified through research.

This project was conducted through a partnership among six researchers from two regional Australian universities. This chapter reports the research approach taken to living that partnership from April 2011 to June 2012. The research approach acknowledges and engages with multiple discursive perspectives on what constitutes research, and its enactment and meshing with the multiple lived realities of delivering externally-funded education research. This chapter is presented in two sections: the research process; and the research design. The research process details the overarching methodological framework for the study—namely, its action research orientation (Mills, 2011; Pine, 2009; Saldaña, 2011). The construction of five cases as part of a collective case study process then provides insights into the phenomenon of learning interactions within online LMSs. In the second section, specifics of the research design’s data collection, analysis and presentation of findings are outlined. It recounts and illustrates the use of both quantitative and qualitative analysis of data in a mixed method approach (Mills, 2011). The chapter concludes with a discussion of the ethical issues considered and accounted for throughout the project.

3.1 The Research Process

In twenty-first century universities, teachers and education technologists can be at the mercy of decisions made by others who present them with fait accompli conditions for curriculum development and pedagogical actions. Thus there is a potential disconnect among the actions of educational developers, learning designers, learning management systems available and those who are actually teaching students. In such situations, the very people that the technological infrastructures are supposed to support are often the ones who are disempowered by those technologies and by the institutionalised systems within which the technological systems are embedded. This is the dilemma that engaged us as education-researchers and a trans-disciplinary group of academics from information technology, nursing and midwifery and professional and teacher education backgrounds.

3.1.1 Action research process

This project followed three cycles of action research that illustrate the “provisional, emergent and evolutionary processes” employed (Saldaña, 2011, p. 90). The cycles depict successive iterations of “learning about research by doing research” or work-integrated-research (WIR) in which such learning is perceived as experiential, reflective and reflexive.

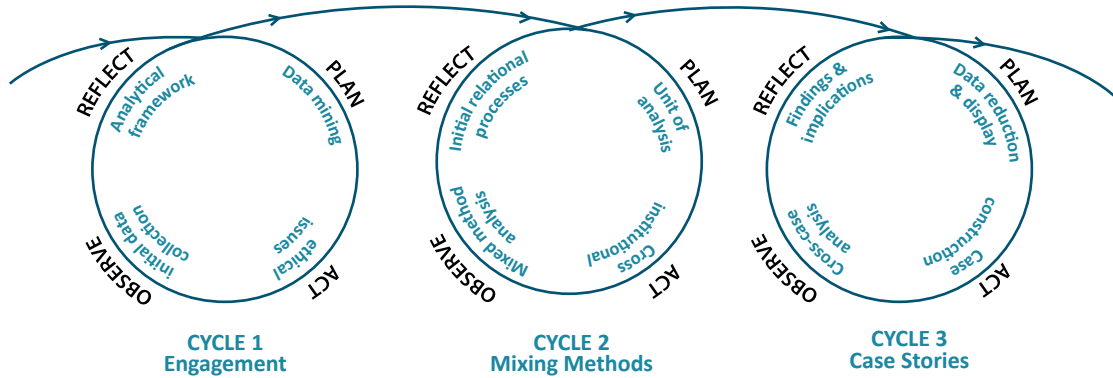


Figure 3.1 illustrates this process and explains each of the cycles.

Cycle 1: Engagement

Cycle 1, engagement, consisted of recruiting knowledge about learning analytics and learner-learner interactions in online learning management systems: the indicators project (Beer, Jones, & Clark, 2009), and using a grounded theory approach to study the learning relationships in online contexts of an undergraduate course (Rossi, 2010). These projects were undertaken by three members of the research team and critical reflection on their outcomes led to consolidation of the design framework for this project.

Ethical considerations and legal issues comprised the first part of the planning process which then moved to designing the substantive research design tools used in later research cycles. Both intra- and inter-institutional activities were undertaken, including:

- obtaining access to the data sets from five courses across two universities;
- setting up a glossary of the analytics codes and their specific definitions for both quantitative and qualitative data analysis moments;
- writing interrogative scripts to analyse quantitatively patterns and consequences of learner-learner, learner-teacher and learner-content interactions;
- establishing the code book for qualitative analysis of the processes and consequences of learner-learner, learner-teacher and learner-content interactions; and
- continuing to review the literature.

Analysing and reflecting upon these actions were instructive because the amount of time taken to obtain access to data even after ethical clearances had been obtained had been underestimated.

Within each institution, further negotiations were necessary to extract the LMS data from the five courses (three at one university and two at the other) that became the project's case studies. Knowledge negotiations among team members had to overcome the tyranny of distance, time, research paradigms, research experience and other work commitments.

By the end of this establishment cycle, data had been collected and analytical frameworks established. Tentative decisions had been made about the direction and actions of the next cycle.

Cycle 2: Mixing methods

The plan for this cycle was to undertake a two-stage process. First, select cases that could be analysed for learner interactions—namely, learners interacting with other learners, learners with the teacher/s and learners with the course content. Second, collect data from each course from the repositories at each institution and prepare it for quantitative and qualitative analyses. The plan was for each case to be developed according to this process.

The quantitative learning analytics was conducted on the LMS logs and course statistics. The course profile documents and electronic transcripts from each course were thematically analysed. Team members worked to their strengths—in either learning analytics or thematic analysis—with both groups analysing the content of all documents for the patterns, processes and consequences of interactions. Up to this stage, there was a concurrent implementation of data collection and analysis in which quantitative and qualitative processes were equally prominent and findings presented with one type of inference (Creswell, 2008; Leech & Onwuegbuzie, 2009; Teddlie & Tashakkori, 2008).

However, as this cycle progressed and initial findings were subjected to further critical reflection, the plan to develop each case study in the same manner was revised. As team members arrived at new insights into the differing potentialities of each type of analysis, a more innovative interpretation of presenting mixed methods activities in case study scenarios emerged. This idea was challenging on a number of fronts because none of the team had undertaken such an experiment and we were yet to be convinced of its efficacy.

The literature review showed that learning analytics within online learning management systems provided only part of the picture, yet the correlations among patterns and consequences were proving thought-provoking for team members. In addition, qualitative analysis of electronic transcript data both confirmed and contested those consequences while providing a rich understanding of relational processes among the LMS participants. The risk was worth taking as the project moved into its third action cycle.

Cycle 3: Case Stories

In this third cycle, there was a re-engagement with the purposes of and the intended outcomes from the project. In telling the case “stories”, it became clearer what the advantages and disadvantages of each method was for teacher-researchers who want to know what is happening in “real time” LMS situations, as well as use the knowledge gained to plan for future iterations of existing courses and/or designing new courses and programs. In the process of refining the analysed data to prepare for the data reduction and display stage of case construction, it became evident that some findings were more informative than others.

For example, it was instructive to confirm just what the learning analytics could provide. It became obvious that it would be difficult to combine these statistically obtained findings with the thematic analyses of electronic forums, posts and discussions transcripts. The thematic analyses were variable in depth and breadth and, despite the coding matrix developed, still provided a challenge in the data reduction and display stage. Content analysis of the course profile documentation was not so problematical in its identification of the contextual and intervening conditions impacting on the course offering.

Work-integrated-research learning continued as more knowledge was needed about the strengths and weaknesses of the case design. Accordingly, a sequence was devised that progressed from one of quantitative-dominant with minor qualitative embedded (Cases 1 and 2), to an integration of quantitative and qualitative in ‘equal’ measures (Cases 3, 4 and 5).

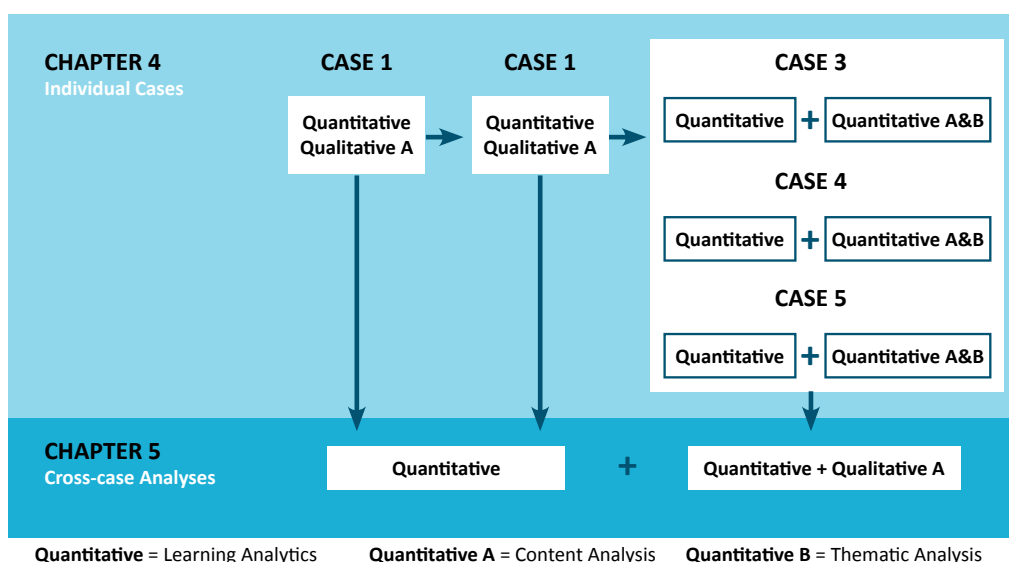


Figure 3.2: Mixed Method Data Analysis Sequence

The findings from these individual cases are presented in Chapter 4. They are then subjected to cross-case analyses in Chapter 5, where the findings from the two quantitative dominant cases are analysed (Cases 1 and 2) and the ‘equally’ prominent quantitative and qualitative findings from each case are analysed (Cases 3, 4 and 5).

This reflexive process enhanced our understandings of learning interactions in online LMSs. It framed a methodologically sound “knowledge democracy” (Pine, 2009) in which and through which team members have invested in individual and collective knowledge production; and it may provide insights for others who wish to continue with such a journey. This has been a quest for knowledge of how to improve as both educators (teachers and technologists) and researchers.

3.1.2 Case studies

Figures 3.1 and 3.2 illustrate the development of case studies embedded in this action research process (Merriam, 2009). Each case was designed to investigate the phenomenon of learning interactions in online LMSs. Two key questions framed the investigation:

- 1 How do learners interact in online courses?
- 2 What are the patterns, processes and consequences of learner–learner, learner–teacher and learner–content interactions in these courses?

Five courses were chosen—three classified as “undergraduate” and two as “postgraduate” coursework. Table 3.1 sets out key features of each case.

Course	Case 1	Case 2	Case 3	Case 4	Case 5
Undergraduate	x	x	x		
Postgraduate	x	x			
Discipline	Education	Education	OH&S	Journalism	Health
Delivery mode	Online*	Online	Blended**	Online	Online
LMS	Moodle™ A	Moodle™ B	Moodle™ B	Moodle™ B	Blackboard™

Table 3.1: Key features of Cases

* This course was also offered on-campus, but only the online offering is used for in this study.

** The term ‘blended’ refers to online delivery with a compulsory 2 week residential during the term offering.

Cases were representative of courses offered in four disciplines: education, occupational health and safety, journalism and health. All courses were embedded within programs that were accredited with professional associations. While all courses used to develop these cases were the online offering, one of the courses (Case 3) had a compulsory residential school on campus. Three LMSs were featured across the five cases: two versions of Moodle™ and one version of Blackboard™.

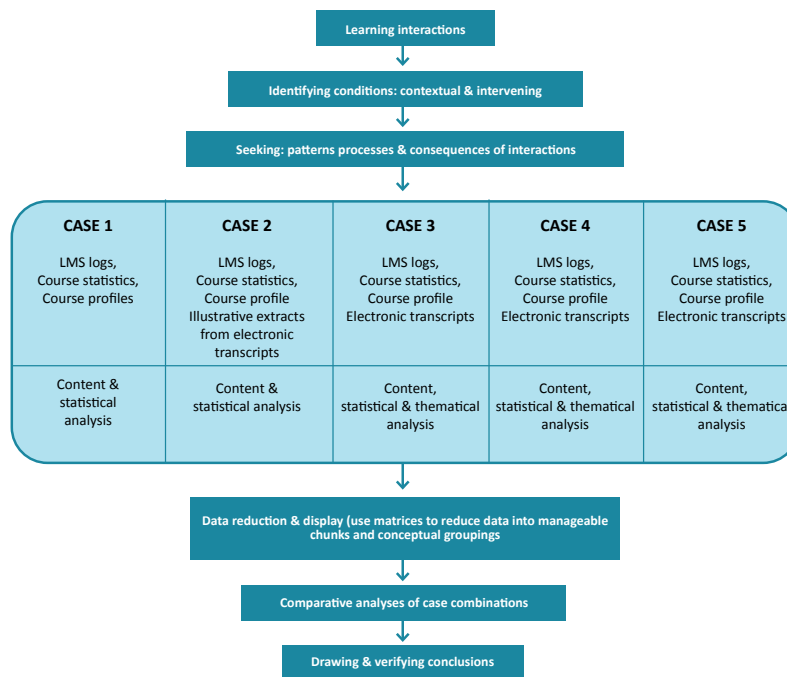


Figure 3.3: A mixed-method Case Study Schemata (Adapted from Rosenberg & Yates, 2007)

The case development and design process provides a means of uncovering the contextual and intervening conditions of interactions in online learning environments through the collection and analysis of diverse forms of data (Rosenberg & Yates, 2007; Yin, 2009). As a result, this embedded case design offers opportunities to emphasise different aspects of each course chosen and provides multiple foci for the analysis of data which facilitates the identification of different levels—for example, the patterns, processes and consequences of interactions occurring within these conditions (Yin, 2009).

Selection of cases for data collection and subsequent analysis was contingent upon access to full data sets of online offerings and snowballing via researchers' networks within the respective universities. This process is elaborated on in the following section.

3.2 Data Collection and Analysis

While interactions within a Blackboard™ course site and two versions of Moodle™ across four other course sites were examined, interactions occurring outside these LMSs were not collected. For example, if two students used non-LMS mechanisms such as skype, facebook or even the telephone to discuss and debate elements of their course, these interactions were not captured by the LMS and could not contribute to the analytics even though they may have influenced the grades the student received.

So, while quantitative methods based on analytics can provide indicators of student engagement, they are not a substitute for more detailed qualitative enquiry. It is also important to note that analytics provide researchers with a perspective on student behaviour that was not possible prior to online or computer-based learning. As already noted, capturing electronic transcripts

from discussion forums, posts and other communications within the LMS and their thematic analysis still only guarantees the capture of interactions within the LMS. Students may allude to 'outside' interactions via other technologies but it is captured only serendipitously if it is actually written in the transcripts.

According to Caruso (2006), the fundamental measure of students' experiences with an LMS is the degree to which they use the system. This links with the historical precedent where class attendance is used as a metric for measuring face-to-face student engagement (Douglas & Alemanne, 2007). In a face-to-face learning environment, quantifying each and every student utterance and action is almost impossible in a large class. However, an LMS-hosted learning environment enables every mouse click by every student within the system to be automatically tracked for analysis at a later date. This is exceptionally useful for researchers endeavouring to examine the effects of student activity and interactions with student results.

For each case, data were collected from four sources:

- 1 **Electronic transcripts, retrieved retrospectively from an archive of each of the five courses;**
- 2 **Course-specific documentation in the form of course profiles;**
- 3 **Institutional handbook entries for programs and courses; and**
- 4 **Non-interactive, static records produced by the LMS for each course in the form of system logs and course statistics.**

3.2.1 Quantitative data collection and analysis

LMSs are at the forefront of the online technologies making a serious impression on patterns of learning and teaching in higher education (Coates, 2006). LMSs, often referred to as course management systems (CMSs) and as virtual learning environments (VLEs), are becoming ubiquitous at universities around the world (Coates et al., 2005) and in a relatively short time have become perhaps the most widely used educational technology in higher education (West, Waddoups, & Graham, 2006). It has been argued that, despite LMSs' increasingly profound effects on learning and teaching (Coates, et al., 2005), research into the educational effectiveness of LMSs is limited (Lopes, 2008) and is often based on assumptions about campus learning environments (Coates, 2006). LMSs have also been accused of encouraging increasingly independent and perhaps isolated forms of study (Coates, et al., 2005); an observation that is, seemingly, supported by research that suggests attrition rates for online students ranges between 20 per cent and 50 per cent higher than those for on-campus students (Dawson, Macfadyen, & Lockyer, 2009). Others have said that LMSs promote content dissemination by making it very easy for organisations to sequence content and create manageable structures for instructors (Siemens, 2004). This is particularly pertinent to this study, as a structured tool

like an LMS dictates and drives the nature of the interactions occurring within the learning environment.

Because online students are not directly observable by teaching staff, as they are in a face-to-face learning environment, other methods are required to monitor student engagement and patterns of behaviour. One such method, known as analytics, uses the vast number of data collected by the LMS coupled with data from other university information systems to carry out statistical and predictive modelling to identify patterns of student online behaviour that contributes to student success. It has been said that analytics have the potential to improve learning, teaching and student success through an awareness of patterns in the data and the application of predictive modelling (Campbell, DeBlois, & Oblinger, 2007). Analytics involve the harvesting and analysis of institutional data to inform decision-making (Dawson et al., 2008). The application of analytics within higher education has been enhanced by the LMS's ability to capture extensive data about individual user and designer behaviour (Heathcoate & Dawson, 2005).

While there is growing interest in analytics, there is minimal research into how analytics information can be harnessed in the design, delivery and evaluation of learning and teaching practices (Beer, Jones, & Clark, 2009). However, it has been shown that such analysis is directly relevant to student engagement, evaluating learning activities and usefully answering important questions (Dawson et al., 2008). Although analytics can help reveal patterns and relationships, they do not tell the user the value or significance of these patterns (Seifert, 2004). A scan of designer and user behaviour within an LMS can never describe in full how they are engaging in the use of online environments for learning and teaching (Heathcoate & Dawson, 2005). While there are limitations to the information that learner analytics can provide, it is also established that a fundamental measure of student experience with an LMS is the degree to which students use the system (Caruso, 2006) which, when coupled with the LMS's ability to capture extensive usage information, presents some interesting possibilities.

Before considering any examples of learner analytics, the following table defines grade awards as used throughout this report for both Institution A and Institution B.

Grade	Percentage	Definition
HD	85%-100%	High distinction
D	75%-84%	Distinction
C	65%-74%	Credit
P	50%-64%	Pass
F	<50%	Fail
WF	Non-completion	Withdrawal fail

Table 3.2: Institutional grade definitions

The following figures are an example of basic analytics and show the relationship between student mouse clicks (also known as hits) on the LMS and student grades at Institution A. This is one of five different learning analytics datasets used in this research project.

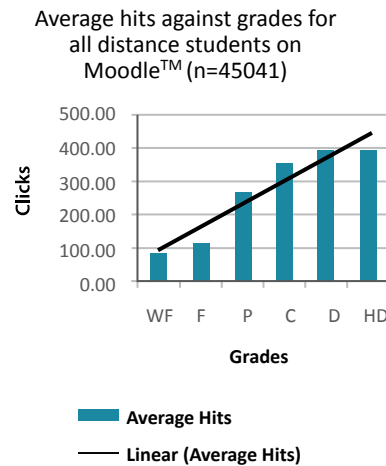
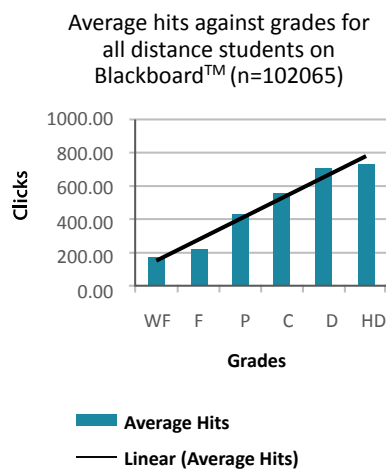


Figure 3.4: Blackboard™ hits against grade. Figure 3.5: Moodle™ hits against grade.

Figure 3.4 shows the average clicks on the Blackboard™ LMS by distance students for each group of grades from the lowest to the highest grades. Figure 3.5 shows the same for the Moodle™ LMS. At this macro level analysis there appears to be a relationship between student achievements, as indicated by grade, and the number of clicks they make within the LMS. The seemingly linear trend between LMS activity and student grade is an indicator of time-on-task as it loosely represents the amount of student activity. Time-on-task is well represented in the literature as being an important indicator of student success and the linear trend in Figures 3.4 and 3.5 appears to confirm this. Note that Moodle™ and Blackboard™ have each taken a different approach to user interface design and this contributes to the variation between the LMSs. For example, students receiving a pass grade in Blackboard™ averaged 420 clicks on course websites while, on Moodle™, the average was far fewer at 269. Blackboard™ has a hierarchical interface that requires users to click into containers to access content areas, whereas Moodle™ has a ‘flat’ user interface that requires less clicking for navigation (see Cross-case Analysis in Chapter 5).

While Figures 3.4 and 3.5 show only averages and are not accounting for the diversity of usage patterns that each grade group possesses, this representation does underline the potential of LMS-collected data to provide insights into what is occurring in the LMS. It is also worthwhile mentioning that both Figures 3.4 and 3.5 show only data relating to the activity of distance students. This is because the learning interactions for distance students are predominantly facilitated by the LMS and their activity data are less likely to be influenced by non-measurable means such as face-to-face learning interactions. This highlights an important limitation of analytics and potentially provides insight into how the operationalisation of analytics can occur.

The analytics in Figures 3.4 and 3.5 are based on correlations between LMS activity and student grades. So, while quantitative methods based on analytics can provide indicators of student engagement, they are not a substitute for more detailed qualitative enquiry. While mining LMS data can help reveal patterns and relationships, it does not tell the researcher the value or significance of these patterns (Seifert, 2004). It is also important to note that analytics provide researchers with a perspective on student behaviour that was not possible prior to online or computer-based learning when it was not possible to track each and every student action within the learning environment in an automated way.

According to Caruso (2006), the fundamental measure of students' experiences with an LMS is the degree to which they use the system. This links with the historical precedent where class attendance is used as a metric for measuring face-to-face student engagement (Douglas & Alemanne, 2007). In a face-to-face learning environment, quantifying each and every student utterance and action is almost impossible in a large class. However, an LMS-hosted learning environment enables every mouse click, comment and action by every student and teacher to be automatically tracked for analysis at a later date. This is exceptionally useful for researchers endeavouring to link online student activity and interactions with student results. In this study the researchers had access to approximately 400 million mouse clicks made by over 135,000 individual students and staff across three separate LMS systems at two institutions.

Computer programming scripts had been developed at Institution A to mine data from their LMS such that analysis could be conducted. Two approaches were used to gain access to data at Institution B and, in combination, provided the needed access to the information to do the analysis. One was to take a Moodle™ “backup” copy of the Institution B courses. This provided all the data about learner-learner and learner-teacher interaction from the course discussion forums. However, it did not provide the information about learner-content. Thus a second extraction process was developed where researchers at Institution A provided the Information Technology (IT) department of Institution B with database query programs that they could run against their database to extract the remaining information. This two-pronged technical approach provided a successful, albeit protracted approach to data gathering. Co-operation with and support from Institution B's IT Department was very good considering that this approach to mining usage data had not been previously attempted.

Computer programming scripts were written for both Blackboard™ and Moodle™ and run against course information derived from each of the case study courses. Additionally, data were aggregated from all courses offered in the same term as the case study courses to provide a point of reference against institutional averages. However, this was only possible for the Institution A case courses, as access to this information was already available. Gaining access to this volume of data from Institution B would have likely further delayed the data extraction process due to the greater risks to that institution's intellectual property.

While many computer programming scripts had been previously written for the Indicators Project, the lens of Anderson's (2008) research into interaction types required new thinking in terms of learning analytics. How does a researcher identify learner-content, learner-teacher

and learner-learner interaction from usage data of an LMS? A search of the literature showed that this approach had not been previously attempted using learning analytics so new methods had to be established to determine what constituted these interaction types from the activity data collected by the LMS. This was not a straightforward process for two main reasons:

- Different LMSs have different navigation philosophies. Blackboard™, for example, has a highly structured, hierarchical user interface where users are required to click into containers to access the course resources or activities. Moodle™ on the other hand has a very flat user interface that presents the course activities and resources on a single page. This meant that the direct comparison of learner-content interactions across the two LMS was not possible.
- What constitutes an interaction? When looking at student activity within the LMS, it can be determined what the student clicked onto but not the significance or value of the click. So while student interactions can be inferred from the learning analytics information, it cannot be substantiated with absolute certainty. Hence the approach of this project where learning analytics was coupled with qualitative methods to examine the complexities of learning interactions occurring within LMS.

As explained previously, this study is concerned with the three main interaction types that occur within an online learning context (Anderson, 2008). In the previous section, it was explained that LMSs record every mouse click that staff and students make within the LMS; this is relatively easy to extract from the LMS activity database using programming scripts. However, it is more difficult to extract exactly what the students clicked owing to the way that each LMS stores this activity data. This means that differentiating navigation clicks from true learner-content interaction is almost impossible and, for the purposes of the analytics side of this study, navigation clicks have been included in the count for learner-content interactions. Additionally, the most popular LMS tool for facilitating learner-learner and learner-teacher conversations is via asynchronous discussion forums where either teachers or students can make posts or reply to the posts of others. The following table explains the analytics definitions used throughout this report.

Action	Description
LMS Page Hits (hits)	A hit is recorded in an LMS each and every time users of the system clicks on a link within a webpage taking them to another webpage within the system. This metric gives a measure of activity of learners and teachers within their courses.
Discussion Forum Hits (dhits)	Like a hit, dhits are related specifically to clicking of links within a discussion forum. This metric gives a measure of user activity within discussion forums, including accessing messages of others and publishing their own.
Content Hits (chits)	Again, similarl to hits, chits are focused on clicks relating specifically to content within the LMS course site. Example chits include clicking on links to pdf documents, Word documents, PowerPoint, webpages within the LMS course site and so on. It provides a measure of learner-content interaction.
Discussion Forum Posts (posts)	Posts count the number of initial messages (posts) commencing a topical thread of discussion within a forum made by a learner or teacher. Combining the posts and replies (see next definition) count generates the total number of messages within a discussion board.
Discussion Forum Replies (replies)	Replies relate only to LMS discussion forum messages that are replies to existing posts or replies. In other words, replies are any messages in a discussion forum that are not an initial post.
Discussion Board Learner - Teacher Post (L-T)	Discussion board messages are structured in a hierarchy where a reply is made to an existing message such that the existing message is a parent. So a L-T interaction is one where the parent of a reply message and the reply message itself are a combination of learner and teacher. In other words, a teacher has responded to a learner or a learner has responded to a teacher.
Discussion Board Learner -Learner Post (L-L)	Similarly to a L-T interaction, a L-L interaction occurs where the parent of a reply message and the reply message itself are both from learners. In other words, a learner has responded to another learner.
Discussion Board Teacher - Teacher Post (T-T)	Although this is quite rare within discussion boards, teachers will reply to their own messages, sometimes to expand on a point. Alternatively, courses can have more than one teacher in which case one teacher may respond to another. Teacher-to-teacher interaction is not investigated in this research and is mentioned only for completeness.

Table 3.3: Definitions of terms used

The relationship between learner and teacher in the discussion forum is illustrated in Figure 3.6, along with the identification of the post and the replies to that post.



Figure 3.6: Example of learner-learner and learner-teacher interactions

The relationship among the three interaction types - learner-content, learner-teacher and learner-learner - and the learner analytics metrics are illustrated in Figure 3.7 below.

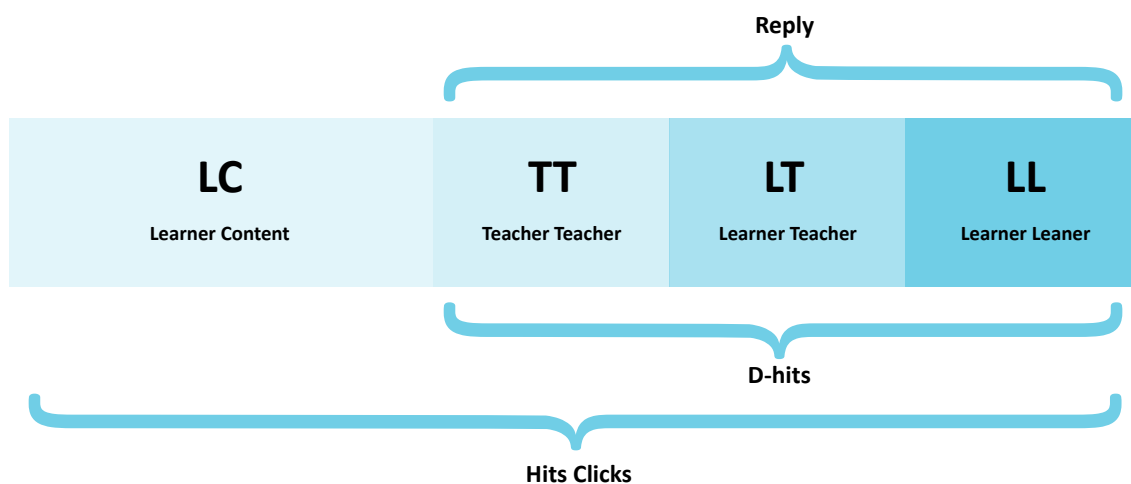


Figure 3.7: Visual representation of learner analytics metrics and Anderson's (2008) interaction types

Hits recorded for a course encompass all interaction types, while dhits refers only to the hits that occur within the discussion forum enclosure. Dhits are representative of forum reads, posts, replies and navigation. Subtracting the dhits from the hits derives the learner-content interactions of a given course.

Description of the case analytics

In addition to the definition of terms outlined above, there are five different datasets derived from the analytics that were used in each of the five cases. The remainder of this section explains these datasets, which have been analysed for each of the five cases in this report.

1. Average hits against grade for each case.

What is the average number of hits made by students who achieved a High Distinction? What is the average number of hits made by failed students? This dataset shows the average number of hits made by students on their course sites, grouped by their grades. This dataset differs from those shown in Figures 3.4 and 3.5 by only focusing on the grades and hits of students within each case rather than institution-wide.

2. Proportion of hits occurring within LMS discussion forum areas for each case.

This indicates where the student activity was occurring within the LMS course sites. A comparison of discussion forum hits with the total hits on the course provides an indication of how prevalent class discussion was in the overall activity within the course site. Note that discussion forum hits (dhits) are an aggregation of forum navigation clicks, forum posts, replies and reads. Note that these figures encompass all discussion forums within the course, including the typical News forum provided by Moodle™, which permits posts only from the teacher, thus precluding any interactions between learners and teachers. Therefore the News forum can contain only posts without replies as given in Table 3.3.

The following example was derived from the Moodle™ activity for all distance students at Institution A.

	Non-forum clicks (hits - dhits)	Forum clicks (dhits)
Moodle™ (all terms)	68%	32%

Table 3.4: Proportion of clicks within discussion forum areas for all distance student/course combinations on Moodle™ at Institution A (n=12870 students).

3. The number of discussion forum hits, posts and replies for each case.

What sorts of activities occur within the discussion? As per Table 3.3, a dhit is the number of clicks within the discussion forums; a post is a discussion board message that starts a topical thread of discussion; and a reply is a message that responds to an existing post or reply. While dhits can provide an indicator of discussion forum activity, the posts and replies made within the forums are more representative of student and teacher engagement and interaction.

	Dhits	Posts	Replies
Moodle™ T1 2011	385113	17154	29586

Table 3.5: The number of dhits, posts and replies for all distance student/course combinations using Moodle™ at Institution A (n=12870 students).

4. Learner–learner, learner–teacher and the ratio of these two interactions for each case.

This shows what proportion of the interactions within each course are learner-learner and learner-teacher. This can give a sense of the nature of the interactions that occurred within the discussion forum area. For example, forums where the teacher asks questions that students are required to answer will show a high degree of learner-teacher interaction, whereas a forum where learners are actively conversing will show a higher level of learner-learner interactions.

For the purposes of this report, the following calculations were applied to the posts and replies as per the definitions in the previous section referring to Table 3.5:

- **Learner-learner interaction.** This is where a learner has responded to the post of another learner.
- **Learner-teacher interaction.** This is where a learner has responded to a teacher or a teacher has responded to a learner.

	Learner-learner	Learner-teacher	Ration of LT to LL
Moodle™ T1 2011	86	56	.65

Table 3.6: Average learner-learner and learner teacher interaction across Moodle™ at Institution A (n=336 courses)

5. Comparison of learner–learner, learner–teacher and learner content interactions for each case.

This shows the proportion of learner-learner, learner-teacher and learner-content interactions within the course sites. This is a breakdown of each case that shows how the learners' interactions are distributed across the course sites. Note that in some courses, particularly those that were facilitated by more than one teacher, an extra interaction type is included in the results for completeness, and refers to teacher-teacher interaction. This occurs when teaching staff reply to other teaching staff, or even themselves, within the discussion forums. Typically, the number of teacher-teacher interactions within courses is very low, as is illustrated in the example graph below of 1% teacher-teacher interaction.

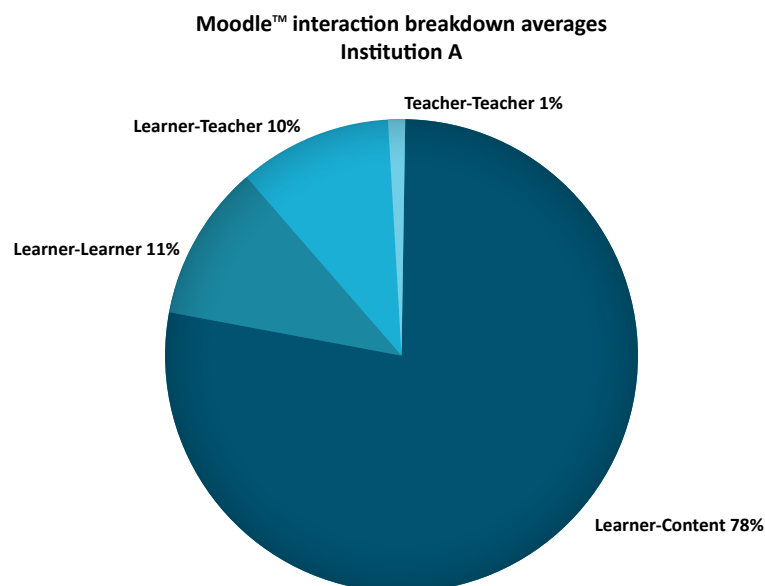


Figure 3.8: Moodle™ interaction breakdown averages

Further details of the learning analytics process are illustrated in the representations of Cases 1 to 5 in Chapter 4.

3.2.2 Qualitative data collection and analysis

Data collected for qualitative analysis consisted of documents and electronic transcripts. The documents comprised course profiles for each of the cases and program information from institutional handbooks. These course profiles were inclusive of information about course structure and design, programs in which the course was offered, synopsis, objectives, learning activities and assessment tasks. Electronic transcripts of activities within each LMS (e.g., discussion forums and discussion boards) were collected from the course LMS sites. In addition, demographic data on learners' genders, ages and course grades were available through the learning analytics' data mining processes.

Data analysis procedures included: (a) learning management system data mining of user activities, student results and demographics; (b) content analysis of course profiles and other related course materials such as handbook entries and assessment marking criteria; (c)

statistical analysis of LMS systems logs and course statistics; (d) categorical analysis according to the central tenets of grounded theory; and (e) thematic constructions of learner-learner, learner-teacher and learner-content interactions.

There was a three-stage data analysis process. First, content analysis was used initially with the demographic and document data. Key features of each course were elicited as well as descriptions of the contextual and intervening conditions embedded in that document. Second, in preparation for the qualitative thematic analysis, raw data from documents and electronic transcripts were initially coded descriptively and imported into the software program NVivoTM (QSR, Version 7, 2006). The program was used as a means of storing and managing the large volume of data downloaded from the archive of each course. During this process NVivoTM was used to record allocations of codes and annotations of documents, create memos about researchers' observations and store categories that contributed towards the interaction themes established.

Three courses were then chosen for conceptually focused and conceptual level axial coding, and a constant comparative method was used to understand and make visible the various connections among actions, interactions, conditions and consequences (Charmaz, 2006; Merriam, 2009). Constant comparative method is "a method that generates successively more abstract concepts and theories through inductive processes of comparing data with data, data with category, category with category and category with concept. Comparisons then constitute each stage of analytic development" (Charmaz, 2006, p. 187).

Figure 3.9 illustrates this process of category development.

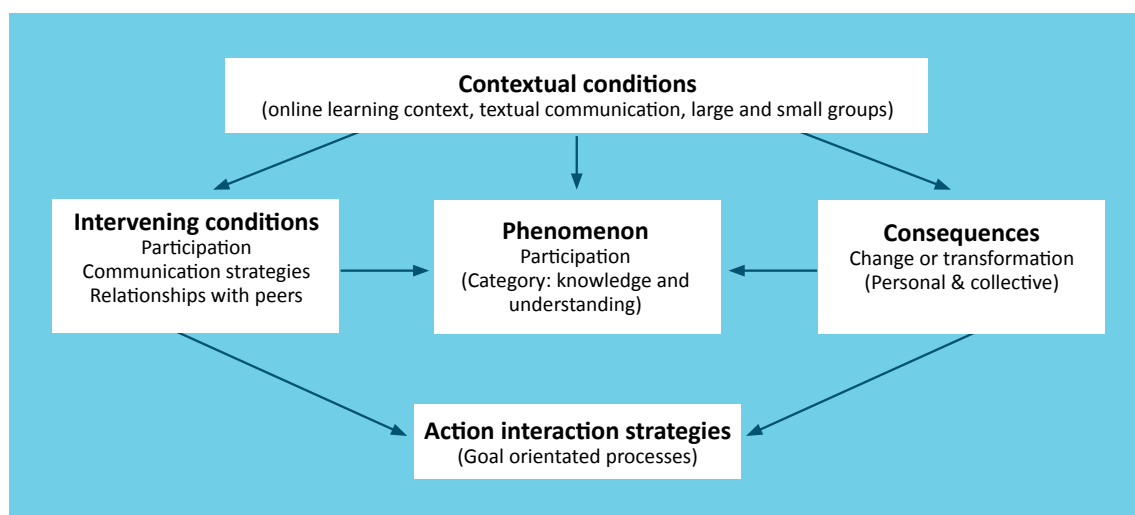


Figure 3.9: Category development for themes
(adapted from Rossi, 2010, p. 119; Böhm, 2004, p. 272).

Data were analysed using these techniques consistent with case study analyses from a social constructivist perspective (Merriam, 2009). Figure 3.9 illustrates also the particular version of qualitative Social Network Analysis (SNA) developed to provide a visual and mathematical analysis based on the way learners and teachers were connected and in order to identify underlying patterns in interactions (Scott, 2000). Relations among learners and teachers (learner-learner; learner-teacher) are illustrated as lines or links between corresponding nodes, which may be directional or non-directional (Aviv et al., 2003).

Within each case, the themes of learner-learner, learner-teacher and learner-content interactions were constructed from these categories. Further specific illustration of this process is provided in Cases 3, 4 and 5 (Chapter 4), which detail the procedures of this qualitative data analysis. Further illustration of these procedures is provided in Chapter 5, Section 5.2, where the finely-grained, cross-case analysis of Cases 3, 4 and 5 contributes to the development of a model of learning interactions.

3.3 Ethical Considerations

Once contractual agreements were finalised, ethical approvals for the project were submitted to the Human Research Ethics Committees (HREC) at both Universities. Permission was duly received: HREC (H11/05-094); and HREC (H11REA089).

A further issue arose in relation to subsequent analysis of student data at the end of each selected course, with one university assigning to the other access to student data from two of those courses so that the learning analytics team members could apply the analytics software programs to those courses.

The need for a confidentiality agreement between the two universities for student data sharing was not known initially as all project team members and line managers thought that access to these data and their sharing were covered under the ethics approval process of each university. However, once it was made known that this required a separate confidentiality agreement, it took until November 2011 for all legalities connected with this activity to be finalised. While all these approvals were eventually sourced and signed, each took more time and involved more discussion and documentation than had been anticipated at the outset of the project.

Each case has been anonymised by referencing only its discipline designation. Course codes or names are not used. All data were de-identified. Features such as level of the offering (under/postgraduate) and LMS used have been included because such information is necessary to understand the interpretations made through the data analysis process. However, they are not of themselves able to provide indicative information about specific courses, teachers or learners. Confidentiality of information was enshrined in the original HREC approvals and the subsequent institution level confidentiality agreement.

This chapter has reported the three-cycle action research process undertaken. The embedded case study design within that process was then elaborated, and ethical considerations have also been addressed. The following chapter presents the five individual cases.

Chapter 4 Cases of online interactions

This chapter provides a detailed analysis of each of the five cases of online interactions in this study. The following table (4.1) is reproduced from Chapter 3 and identifies the key features for each of these five cases.

Course	Case 1	Case 2	Case 3	Case 4	Case 5
Undergraduate	X			X	X
Postgraduate		X	X		
Discipline	Education	Education	OH&S	Journalism	Health
Delivery mode	Online*	Online	Blended**	Online	Online
LMS	Moodle™ A	Moodle™ A	Moodle™ B	Moodle™ B	Blackboard™

Table 4.1: Key features of Cases

* This course was also offered on campus, but only the online offering is used for this Case.

** The term ‘blended’ refers to online delivery with a compulsory 2 week residential during the term offering.

Case 1 studies an undergraduate course from the education discipline. While it was offered both on-campus and online, only its online offering was analysed in Case 1. Case 2 studies a postgraduate course—also in the field of education. Both Case 1 and Case 2 courses used Moodle™ as their LMS. Case 3 studies a postgraduate course in Occupational Health and Safety and is the only Case to include a blended offering of a course with a compulsory 2-week face-to-face component. Case 4 studies an undergraduate course in Journalism and, like Case 3, was delivered using the Moodle™ LMS. Finally, Case 5 studies an undergraduate course in Health and is the only case that involves the Blackboard LMS.

Sections 4.1 through 4.5 of this chapter provide a detailed analysis of Cases 1 through 5 respectively. As discussed in the previous chapter, Cases 1 and 2 are analysed primarily through a quantitative lens, with a small measure of qualitative analysis, while Cases 3, 4 and 5 are comprised of an even distribution of quantitative and qualitative analysis. Each case commences with a description of the course, student demographic information, and contextual and intervening conditions before providing a detailed quantitative analysis using learner analytics. For Cases 3, 4 and 5, the learner analytics is followed by a detailed qualitative analysis. Each section is brought to a close with a summary of key points discovered in the case analysis.

Case 1 and 2 Section Heading	Purpose
Course Description	Includes course synopsis, course objectives, learning activities and assessment
Participants	Student age, gender and grade distribution
Contextual Conditions	Textual communication and groups
Intervening Conditions	Course design and participation
Learner Analytics	Quantitative Analysis using the five datasets described in Chapter 3.
Summary	Summary of key points discovered
Case 3, 4 and 5	Purpose
Course Description	Includes course synopsis, course objectives, learning activities and assessment
Participants	Student age, gender and grade distribution
Contextual Conditions	Textual communication and groups
Intervening Conditions	Course design and participation
Learner Analytics	Quantitative Analysis using the five datasets described in Chapter 3
Qualitative Analysis	Qualitative analysis composed of the following components
Quantitative Summary	<div> <div> Learner-Learner Interaction</div> <div> Learner-Content Interaction</div> <div> Learner-Teacher Interaction</div> <div> Summary of key points</div> </div> <div> An analysis of the patterns, processes and consequences of learner-learner interactions </div>

Each of the Cases are structured according to Table 4.2.

Table 4.2: Structure of Cases

4.1 Case 1

Case 1 studies an undergraduate course from the education discipline, which was offered using the Moodle™ LMS. This section provides a detailed analysis of this course using learner analytics.

Synopsis

This course has three connected components: the content areas associated with four learning areas associated with the Queensland and Australian curriculum documents, the pedagogical approach of inquiry for learning and an integrated curriculum design. The four learning areas associated with this course are: Mathematics, Science, Technology, and Health and Physical Education. Literacy skills and ICT integration are central to Teaching and Learning in the 21st Century. Students will be required to develop unit learning plans which demonstrate knowledge of appropriate curriculum documents and the integration of knowledge and skills across learning areas utilising a pedagogy based on inquiry. These plans will need to demonstrate how assessment for and of learning is integrated into the design and proposed delivery of these learning episodes.

Course objectives

The course objectives define the student learning outcomes for a course. The assessment item(s) that may be used to assess student achievement of an objective are shown in parenthesis. On completion of this course students will be able to:

- 1 demonstrate understanding of the key curriculum documents (Assignments 1 & 2)
- 2 demonstrate understanding and application of an integrated curriculum design process in designing a unit plan (Assignments 1 & 2)
- 3 demonstrate the understanding and application of an inquiry for learning approach (Assignments 1 & 2)
- 4 demonstrate an understanding of how to apply assessment processes for and of learning in an integrated inquiry led approach required for unit planning (Assignments 1 & 2)
- 5 demonstrate how mandated assessment tasks e.g. Queensland Comparable Assessment Tasks (QCATs) can be integrated into the unit plans to demonstrate the knowledge, skills and understandings associated with the learning areas identified for this course (Assignments 1 & 2)
- 6 demonstrate knowledge of appropriate ICT uses for teaching and learning (Assignment 2)
- 7 demonstrate competence in and appropriate use of language and literacy, including spelling, grammar, punctuation and bibliographic referencing. (All assessments)

Learning activities

Learning is about building connections between knowledge, skills and understandings across discipline areas. Learners in the 21st century will need the thinking skills of problem identification and solving, flexibility, and the social skills of working in groups to co-operatively define and solve new challenges in creative ways. This course has been designed to build on EDG2001 to assist pre-service teachers to extend their ability to make cross connections between content knowledge areas and the thinking skills to solve new problems in a logical and creative manner and to translate these understandings and skills into the development of learning plans for their future students.

Topics

Description	Weighting (%)
1. Key curriculum documents Years 1-10	10.00
2. Designing a unit plan	10.00
3. Integrating mandated assessment tasks	5.00
4. Science	15.00
5. Maths	15.00
6. Technology	15.00
7. Health and Physical Education	15.00
8. Integrating ICT and literacy skills into unit plans	15.00

Student workload requirements

Activity	Hours
Directed Study	70.00
Independent Study	70.00

Assessment

Description	Marks	Weighting (%)
Assignment 1: Inquiry project	40	40
Assignment 2: Unit plan and essay	60	60
	100	100

Participants

Students studying a pre-service graduate entry teacher education program enrol in this course for term 2. Both domestic and international students can partake in the course, with 58 students in total enrolled.

The following chart (Figure 4.1) shows the distribution of student ages within this course.

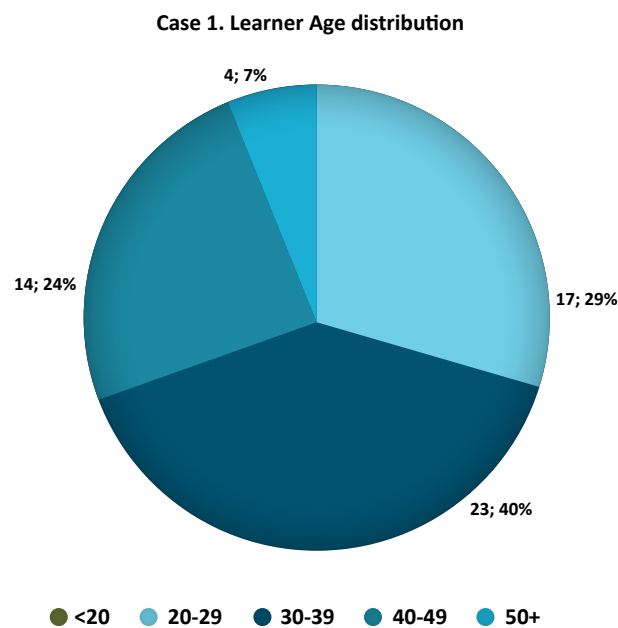


Figure 4.1: Distribution of learner age in Case 1.

The youngest student was 22, while the oldest was 62 years of age. The mean age for the course offering was 35 years old.

The following chart (Figure 4.2) shows the gender distribution of students for this course.

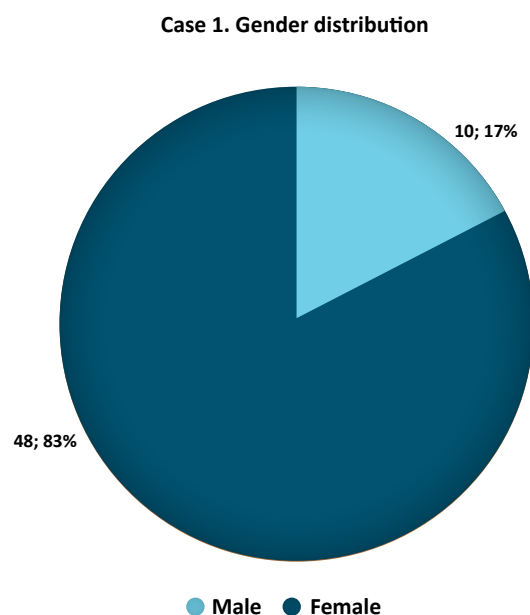


Figure 4.2. Gender distribution for Case 1

As can be seen, the class largely comprised female students. Ten students or 17 per cent were male.

The following chart shows the grade distribution for Case 1.

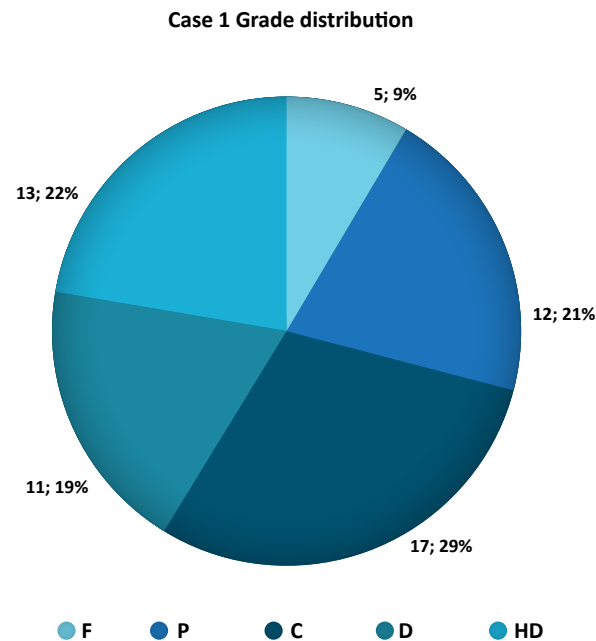


Figure 4.3: Grade distribution for Case 1.

A relatively even distribution of grades for the offering is observed in Figure 4.3.

Contextual conditions: Textual communication and groups

The course is principally designed for Graduate Diploma students who already have a degree and, hence, is principally a graduate entry course; in the Graduate Diploma of Teaching and Learning program some courses are also taken by undergraduate students; this one is a level 3 course but is effectively a graduate entry level pre-service course and, in the semester of analysis, no undergraduate students were enrolled.

This course had a pre-requisite so all students had some familiarity with the LMS and discussion forums.

Communication was facilitated through the Moodle™ LMS study desk because it was an online offer. There was an on-campus offer at the same time but this data was not included in this project. The texts provided included the study guide. Discussion forums provided the principal place for interaction—3 or 4 students in small-scale groups that were formed around one of the summative assessment pieces; these are not analysed here.

There was a Wimba Classroom available but students did not elect to use it, except for some of the small-scale groups. The course examiner responded promptly; Graduate Diploma students have limited time, because they: have to squeeze a lot of information and activity in; are

on-campus for only six weeks that semester and five weeks for internship and four weeks professional experience for the other course that semester.

There was no participation mark and no enforced studydesk participation. Nearly all students did engage with the small group because it was around assessment. Four students were expelled from the small group for not contributing sufficiently (they had to do the task on their own). Three KLAs (Key Learning Areas) had to be covered, but content was not being taught in the course; the three KLAs had to be known already or covered independently. There was a self-supported study module for each of the KLAs to ensure pedagogical knowledge (e.g., how to design effective unit plans in particular KLAs), but no actual/separate coverage of the KLAs in the course (a lot of self-directed and self-evaluated learning was required if the students did not have that pedagogical knowledge already). The students were from a wide variety of disciplinary backgrounds. They had little time to complete three big KLAs plus demonstrate knowledge of literacy, technology and assessment and how to integrate those three elements into unit plans.

This was a second semester course so students should have had some knowledge from the previous semester of the LMS, the time pressures and how to operate the Studydesk. The Studydesk had a slightly different setup that used icons rather than being down the page in weekly activities; another course in the same semester also used this approach, so that students enrolled in both courses in that semester would have heightened familiarity with this different setup

All the modules were posted from the start of the semester. Students could complete the self-study modules at any time during the semester. The self-study modules had no students interacting with other students or the course coordinator.

In general, students did not respond to the prompt questions about materials provided for the first three (non-self study) modules.

Intervening conditions: Course design and participation

The students found themselves incredibly busy on professional experience; many students had unrealistic ideas of how much time was needed during the professional experience and in the internship. Another condition was some groups not working effectively owing to non-participation by students; however, some groups did work effectively. There were a couple of glitches with Wimba Classroom when used by the small group discussions (not analysed in this Case). The assessment for the small group discussion was 40 per cent (24% for the group work, 16% for the individual student reflection). Time on task given all the competing priorities and demands was a concern for many students; they were concerned about the lack of sufficient time to complete all the required assessment tasks rather than about not being able to learn what was required.

The following section contains a quantitative analysis of Case 1 using learner analytics data extracted from Institution B's Moodle™ database as described in Chapter 3. This is with the exception of student grade information which was provided to the project by the teaching academic.

Learner Analytics

The Case 1 course was offered by Institution B using the Moodle™ LMS and had 58 distance students enrolled. While institutional average statistics were available to researchers for Cases 3, 4 and 5 from Institution A, such statistics were not available for analysis in Cases 1 and 2 from Institution B due to technical and organisational constraints. Therefore, the following results do not include comparisons with institutional averages as was possible in Cases 3, 4 and 5.

Figure 4.4 below shows the average hits on Moodle™ for each grade group from Case 1.

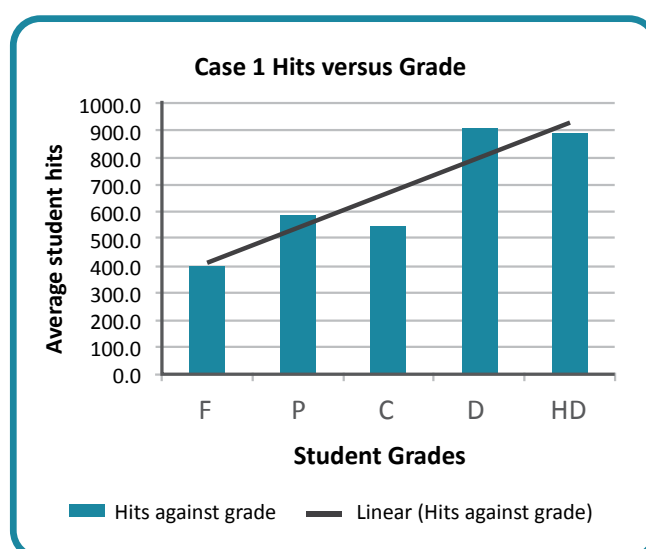


Figure 4.4: Average hits against grade for Case 1

The linear trend shows a similar pattern to that found in Cases 3, 4 and 5 and from Institution A averages, where increased student presence on the LMS generally contributes to student success. Note the anomaly of 17 Credit-awarded students having slightly lower hit count than their Passing counterparts. Additionally, there is another anomaly in the high end performing students; High Distinction students on average having slightly fewer hits than their Distinction counterparts. These anomalies have appeared at the course-level periodically in Institution A data sets. The existence of similar trends cross-institutionally is highlighted in Chapter 5. The quantity of hits that a particular student will make on the LMS is highly dependent on a multitude of individual factors such as their familiarity with the course content, their experience with the LMS, their learning preferences and their available time to complete the course.

Table 4.3 shows what proportion of student hits occurred within the Moodle™ discussion forums. Sixty-two per cent of student clicks in Case 1 were made in the forums, as compared to 38 per cent in the remainder of the course site. The course required students to work in groups

	Non-forum clicks (hits - dhits)	Forum clicks (dhits)
Case 1	38%	62%

Table 4.3: Proportion of clicks within discussion forum areas in Case 1

While Table 4.3 shows the proportion of hits and dhits, Table 4.4 focuses on the quantity of dhits in the forums, along with the number of posts and replies.

	Dhits	Posts	Replies
Case 1	25198	444	1469

Table 4.4: The quantity of dhits, posts and replies for all students in Case 1

Table 4.5 details the number of learner-learner and learner-teacher interactions, along with the ratio of interaction between these two types.

	Learner-learner	Learner-teacher	Ratio of LT to LL
Case 1	1360	109	0.08

Table 4.5: Learner-learner, learner teacher interaction in Case 1

As previously mentioned, the course included a groupwork assessment, and a Moodle™ discussion forum was provisioned as a group collaborative space. It is often postulated that assessment drives learning—modern students are often focused on the bar by which they are measured for success in their courses. This explains the significantly high learner-learner interaction count and the low ratio of 0.08 in Table 4.5—the highest and lowest respectively of all the case study courses.

The following chart (Figure 4.5) provides a breakdown of learner-learner, learner-teacher and learner-content interactions within Case 1.

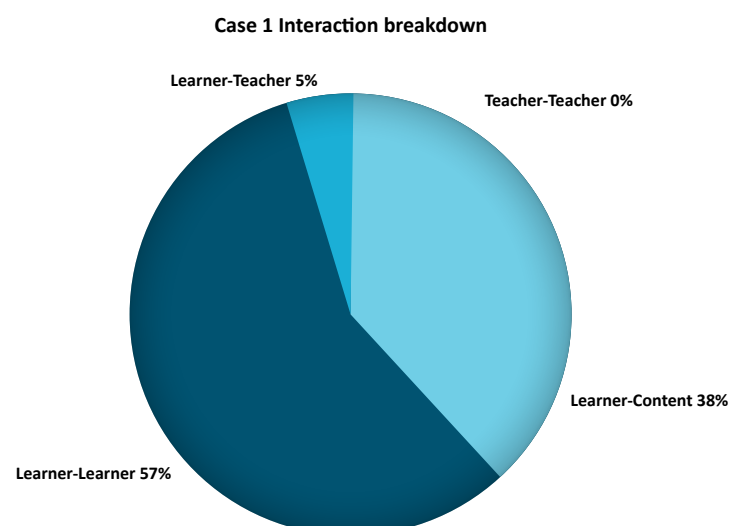


Figure 4.5 Interaction types within Case 1

Proportionally, Case 1 has the highest level of learner-learner interaction and also the lowest level of learner-teacher interaction of all the cases. This suggests that the teacher had limited engagement in the groupwork forum space, leaving the students to support one another. Interestingly, the learner-content interaction proportion of 38 per cent supports the notion that the students continued to engage with the course content in addition to the groupwork engagement.

Summary of quantitative analysis - Case 1

- **Anomalies in the hits versus grades analysis exists beyond Institution A averages.**
- **The learner-learner interaction level aligns with the groupwork course learning design and supports the notion that assessment equals learning.**
- **The teacher had limited engagement with the students as compared to other case courses.**
- **The learner-content interaction remained relatively high despite the focus of the groupwork.**

4.2 Case 2

Case 2 studies a postgraduate course in the field of education, which was delivered using the Moodle™ LMS. This section provides a combined analysis using both quantitative and qualitative methods of the course. Course Structure and design:

This course was an elective in two postgraduate Masters level programs. It was only offered online.

Synopsis

Students in Case 2 will engage with the design and creation of exciting, intellectually challenging and authentic learning environments in which ICT changes not only what students learn but also how they learn, as we move forward in the 21st century. Within a framework of contemporary learning theories, participants in this course will examine how ICT might be used to both enhance and transform learning.

Course objectives

The course objectives define the student learning outcomes for a course. The assessment item(s) that may be used to assess student achievement of an objective are shown in parenthesis. On completion of this course, students will be able to:

- 1 **outline the influence on curriculum and pedagogy of historical and current international and national policies and initiatives relevant to the use of ICT in diverse learning and teaching contexts (all assignments);**

- 2 describe, discuss and apply teaching and learning theories and frameworks that inform ICT pedagogies (all assignments);
- 3 discuss and reflect upon the role of ICT in the curriculum, learning and teaching to enhance and transform what and how students learn (all assignments);
- 4 design and evaluate worthwhile student learning experiences in which ICT are integral to the curriculum, teaching and learning (all assignments); and
- 5 demonstrate competence in and appropriate use of language and literacy, including spelling, grammar, punctuation and bibliographic referencing (all assignments).

Student should spend at least 82 hours on directed study and, likewise, 83 hours on independent study.

Assessment

Description	Marks	Weighting (%)
Assignment 1: Case Studies	20	20
Assignment 2: Investigation	50	50
Assignment 3: Peer Review articles & ICT in Education	30	30

Participants

Students can take this course as an elective in any of the education discipline Postgraduate programs offered by the institution. This course is not a core course in any of the specialisations. Occasionally, undergraduate students choose to include this course as an elective. There were 20 students enrolled in this Case course.

Figure 4.6 shows the distribution of student ages within this course.

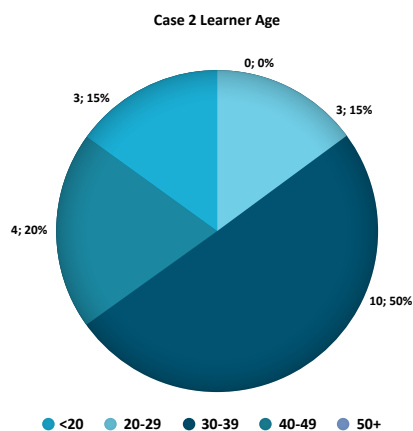


Figure 4.6: Distribution of learner age in Case 2

The youngest student was 23, while the oldest was 54 years of age. The mean age for the course offering was 38 years old.

Figure 4.7 shows the gender distribution of students for this course.

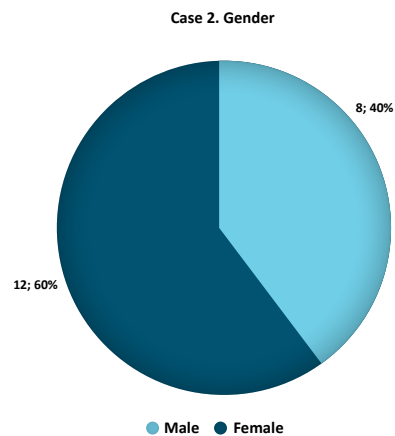


Figure 4.7: Gender distribution for Case 2

The majority of students in this offering of the course were female, 12 as compared to 8 male students.

Figure 4.8 shows the grade distribution for Case 2.

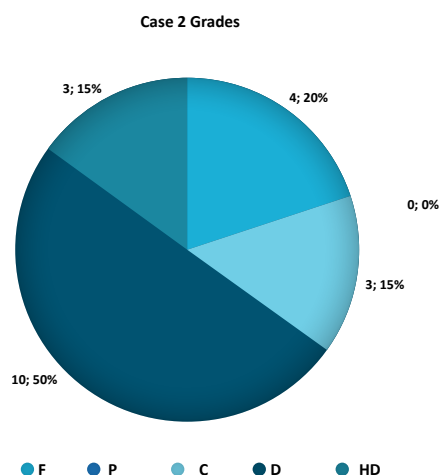


Figure 4.8: Grade distribution for Case 2

The course has a high proportion of Distinction (D) awarded students, with the second largest grade group comprising failed (F) students.

Contextual conditions: Textual communication and groups

This is a postgraduate course that is facilitated by a very experienced part-time, contract staff member. The contextual conditions are established from the beginning of the course with a welcome forum and also one module for each week where students can respond to activities and ask questions (e.g. the questions link the prompt materials to the students' respective experiences and contexts).

There is a lot of sharing by students saying they had found particular articles, linked their reflections to scholarly literature and, then, incorporated their thinking into the course's summative assessment tasks. The students also needed to write a journal article for assignment 2. They were given examples from five different journals and then had to write their own, with the audience being ICT teachers. They were given a structure for writing the article.

As with the other cases, the summative assessment regime exercises a significant influence on the quantity, quality and character of learner interactions in the respective course.

This course was structured in order to promote student exploration of issues; ICT students are often open to using technologies to find out new ideas about technologies (e.g., sharing ideas for solving problems with EndNote).

In this semester of offer, students and the staff facilitator were affected by the widespread flooding.

Intervening conditions: Course design and participation

At least one activity each week and one assessment item promoted learner interaction and student collaboration.

Within this Case, a degree of synergy was discerned between the learning activities and assessments within the course. For example the assignments related primarily to the application of content knowledge in a workplace setting and incorporated, primarily, individual elements. In this Case, findings from the learner analytics interrogation are now presented together with qualitatively nuanced interpretations according to the patterns, processes and consequences of interactions in this postgraduate course.

Patterns

This course (Case 2) was offered to students of Institution B using their installation of the Moodle™ LMS, and institutional averages were not available for comparison.

Figure 4.9 shows the average hits on Moodle™ for each grade group from the course for term 1, 2011. It should be noted that no students in this offering of the course were awarded a grade of Pass. As with Case 1, an anomaly exists in the linear trend where failing students (4 students) had more hits than credit students (3 students). Apart from the lack of passing (P) grade students, this hits versus grades comparison has similarities with Case 1. Furthermore, for the higher performing students, those with High Distinctions (3 students) had slightly fewer hits than students with a Distinction grade (10 students).

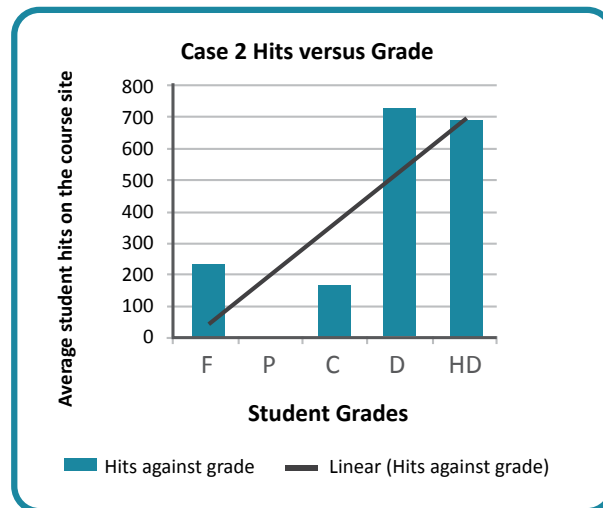


Figure 4.9 Average hits on Moodle™ for Case 2

Table 4.5 shows what proportion of student hits occurred within the Moodle™ discussion forums. Similar results to Case 1 are shown where 64 per cent of hits to this Case 2 course site were made in the forums, as compared to 62 per cent for Case 1.

	Non-forum clicks (hits - dhits)	Forum clicks (dhits)
Case 2	36%	64%

Table 4.6 Proportion of clicks within discussion forum areas for Case 2

While Table 4.6 shows the proportion of hits and dhits, Table 4.7 focuses on the quantity of dhits in the forums, along with the number of posts and replies.

	Dhits	Posts	Replies
Case 2	7117	144	347

Table 4.7: The quantity of dhits, posts and replies for all students in Case 2

Table 4.8 details the number of learner-learner and learner-teacher interaction counts, along with the ratio of interaction between these two types.

	Learner-learner	Learner-teacher	Ratio of LT to LL
Case 2	281	63	0.22

Table 4.8: Learner-learner, learner teacher interaction in Case 2

The learner-teacher count proportionally was quite high as given in Figure 4.10 below, with 12 per cent, yet, in raw figures, as shown in Table 4.8, was unremarkable with a count of 63 interactions over 281 from learner-learner interactions. In other words, the number of raw interactions between learner-teacher was quite low as compared with other case study courses yet, proportionally, is seen much higher due to the number of learner-learner interactions. The course also has one of the lowest enrolment figures of only 20 students, second only to Case 5 (see Chapter 5: Cross-case analyses).

Figure 4.10 provides a breakdown of learner-learner, learner-teacher and learner-content interactions within Case 2.

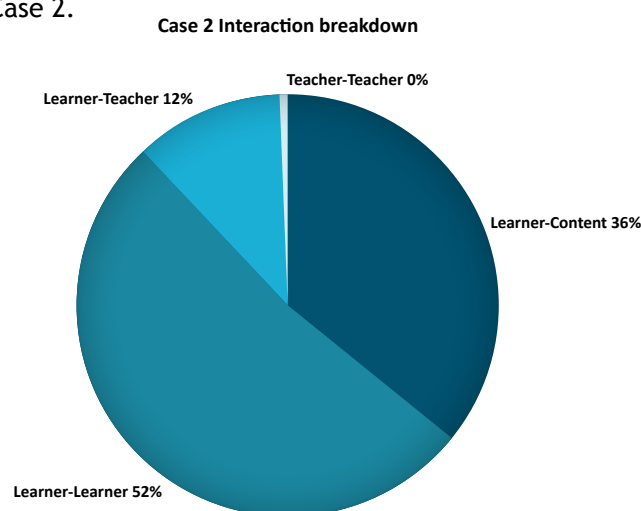


Figure 4.10: Interaction types within Case 2

Learner-learner interaction was very high, second highest only to Case 1, which involved student group work. Qualitative analysis of student posts and replies indicates that a strong sense of community and togetherness had formed with the class as a result of the tragedies inflicted upon many students from the Queensland floods that had occurred at the time. This accounts for the unusually high proportion of learner-learner interactions in the absence of any mandated groupwork activities in the course. These interactions often manifested in a number of very long threads with many different contributors to the discussions and were overwhelmingly positive and supportive with very little negativity displayed. Feelings and reactions to online learning and the use of forums as a learning tool and medium of discussion were generally positive,

I've found the social forum really handy", "... and have certainly enjoyed the ease of online learning.

There was only one learner who expressed a strong dislike to learning in an online environment:

"I do not post personal information to forums and will not be posting a picture of other personal details."

There was a lower degree of learner-teacher interaction as compared to the other two categories. This could be explained by a lack of presence by the teacher at commencement of the term, due to flooding in the region at the time and the teacher's inability to access the internet for online teaching.

This qualitative analysis of the forum message contents revealed a lower degree of learner-content interaction compared to learner-learner interaction. Many message threads were comprised of learners offering personal opinions of study tasks and assessment. However, there were also a significant number of group discussions and debates regarding the material. The majority of learner-content focused messages reflected an enthusiastic attitude to the content, either expressing agreement with it or acknowledging that the content was interesting and thought-provoking.

Processes

Teacher-initiated posts at the beginning of semester consisted mainly of instructions and directions on how the course would run, staff introductions, availability of staff, and advice on contributing to the forums, which did not involve or require any direct response from learners. Teacher-initiated posts later in the semester consisted of messages welcoming individual students to the course as part of the general introduction forum. Replies by the teacher to posts usually involved answering queries regarding assessment technicalities, such as word count, due dates and referencing, rather than specific queries regarding content.

Learner-Learner interactions covered a wide range of themes, ranging from social interactions to discussions of content. Two of the longest threads on the forum were the Introduction thread, and the Sharing Study Tips thread. Most of the learners involved in the course introduced themselves at the beginning of the semester and were very willing to share both personal and professional information about themselves. The Study Tips thread was also contributed to by a number of learners discussing various ways or methods of studying in general and online study in particular.

Interactions among learners were universally positive, with very high levels of praise, encouragement (*"Good luck with the course!"*, *"Happy studying!"*), and expressions of gratitude (*"And thanks for all of your advice everyone...it is very much appreciated!"*). A number of learners expressed a desire to remain in contact with other learners once the course was completed, and/or discussed plans for future studies. For example, *"feel free to drop me a line if we end up in the same class again"*.

Learners would post their interpretation of content or readings within the course, often referring and relating back to their own experiences and observations. Phrases such as *"I feel"*, *"I believe"*, *"I think"* and *"It seems"* were used frequently to suggest an opinion. There was also a very high incidence of learners using direct quotes from sources to support opinions, or

highlight information that was considered to be of particular interest. While a number of these threads were single posts with no reply, many of them prompted responses from other learners, resulting in debate and discussion, agreement and disagreement and sharing of other opinions. Posts were often deliberately worded in order to promote discussion i.e. *“What do other people think?”* Discussions of journal articles set as readings often lead to discussions in other areas, particularly the use of ICT both in and out of their classrooms and other education contexts in which they were working.

Consequences

Clear instructions were provided on the forums at the beginning of the Semester regarding staff availability, contact details and the purpose of the forums as being the primary medium for engaging with the course. For example, *“Please note that there are discussion forums set up for each of the modules...Introduce yourself in the social forum and use that forum for social chatting”*.

As a result, learners obtained a clear understanding of what was expected of them. Learners were made to feel welcome, which resulted in a stronger sense of belonging and community. Learners were also encouraged from the outset to actively participate in the forums and use that space as the primary means of communication—therefore, the importance of open dialogue and discussion among learners and teachers were fostered.

Two unexpected but beneficial consequences may have arisen from the aforementioned floods that were occurring at that time. Many participants in the course were either directly affected, or knew people who had been affected by the floods. As a result, a strong sense of community and togetherness was developed very early in the course, with strong levels of sympathy/empathy towards those affected. For example, *“Our thoughts are with those who have been devastated by the recent floods across Queensland and the other states in Australia”*.

As has already been mentioned, the teacher was unavailable due to a loss of internet connection for a long period of time. Consequently, learners did not rely on the teacher as the primary source of information, but took to discussing and solving problems amongst themselves, thus contributing to the high degree of learner-learner interaction.

Because of the high degree of Learner-Learner interaction at the beginning of the course, through participants introducing themselves and sharing information, a strong sense of community and togetherness was developed. This sense of community further encouraged learners to post on the forums. As one learner stated, *“From the very beginning of this course we have been encouraged to collaborate with our peers. It is through conversation with other learners in a community of practice that learning will be embedded”*.

The high level of learner-learner interaction suggests that learners felt comfortable discussing and sharing their challenges and concerns with various aspects of the course and, in doing so, assisted one another in the process. This online social environment cultivated a spirit of

co-operation learner-to-learner obviating intervention from teachers. Learners assisting one another with interpretation of the assessment requirements were clear examples of this spirited co-operation. Because of the willingness of learners to both encourage and provide feedback to each other in their forum messages, learning within the course transitioned from a purely individual to a shared experience, with all contributors adding to the knowledge gained.

Learners also examined the content at a deeper level—rather than just repeating content, or expressing an unsupported opinion regarding the content—by being able to reflect on the content, relate it back to personal experiences and other readings, and debate with other learners as to the true meaning of the content. This is evidence that content is being engaged with at a deeper level.

Conclusions

Overall, there was a minimal teacher presence, allowing students to either solve their own problems or come to a solution as a group. The teacher contributions that were present consisted of clear instructions at the beginning of semester, messages of welcome and occasional responses to queries directed specifically to teachers. This created a welcoming climate, but also one where learners did not come to rely on the teacher for problem solving.

Learner-learner interaction was the dominant form of interaction within the course. A minority of this interaction was task-oriented, such as discussing assessment or technical questions and answers. The bulk of the learner-learner interactions comprised affective communication, which was universally positive in nature. Learners were (mostly) very enthusiastic about online learning and the use of technology both in and out of the classroom. Learners were willing to introduce themselves, share personal information and study tips and interact fully with other learners. There were high amounts of praise, support and encouragement, and a warm and welcoming climate was maintained throughout the semester.

Learner-content interaction consisted of a number of “individual” threads where learners provided their opinion/interpretation of a particular reading. However, there were also a high number of threads where learners discussed and debated content. Much of the content was discussed on a surface level, but a significant proportion also involved linking content back to other content, readings and personal experiences. Summary of quantitative and qualitative Analysis-Case 2

- **Anomalies in the hits versus. grades analysis are similar between both USQ cases.**
- **Despite an absence of formal groupwork in Case 1, the course has significantly high learner-learner interaction levels, potentially influenced by localised tragic circumstances as a result of natural disaster in the region.**
- **The teacher had limited engagement with the students, as compared to other case courses.**

4.3 Case 3

Case 3 studies a postgraduate course in Occupational Health and Safety and was offered using the Moodle™ LMS. This section provides a quantitative analysis of the course, followed by a qualitative analysis.

Course Structure and design: Synopsis, learning outcomes, learning activities and assessment

This Case was a postgraduate course within the discipline of occupational health and safety. The course was described within the handbook and course profile as a flexible delivery offering. The mode of delivery was blended as attendance at an on campus residential school was compulsory (for assessment purposes).

The course synopsis stated:

This advanced level course examines relationships between the worker, their equipment and work environment. A problem solving approach is used to assist learners in their discovery of the physical and cognitive realms of work. Topics covered include work physiology, manual handling and anthropometry; work organisation issues, for example, shift work and workload; equipment and job design parameters which promote cognitive compatibility. Case studies are used to help learners challenge their current understandings of the nature of work. All students are required to attend a compulsory residential school at the [Institution Campus]. It is a requirement of this course to have access to the [Institution website] and internet.

Learning activities

In this Case, the LMS that was used to both administer and deliver the course was Moodle™. A social format was used and course content was structured around 4 discrete modules. Students were instructed, within the course profile, of the need to access course resources and complete a number of Moodle™ activities. In this Case, educational emphasis was placed upon learner-content and to a considerably lesser extent learner-learner interaction.

Assessment

Four assessment items were associated with the course. Each assessment item was individually weighted:

Assessment item 1: Moodle™ Activities	10%
Assessment item 2: Manual Task Analysis	40%
Assessment item 3: Critical Reflection	50%
Assessment item 4: Practicum	0%

There was no formal examination for the course.

Participants

Participants were students who had enrolled in and completed the postgraduate, online. The course was a unit of study offered as core within two occupational health degrees and as an elective in an alternative postgraduate degree. Learners who participated in the study were, therefore, enrolled in three different postgraduate programs

Participants consisted of 33 students and one teacher, responsible for managing the course during the academic term. The age brackets for learners is shown in Figure 4.11.

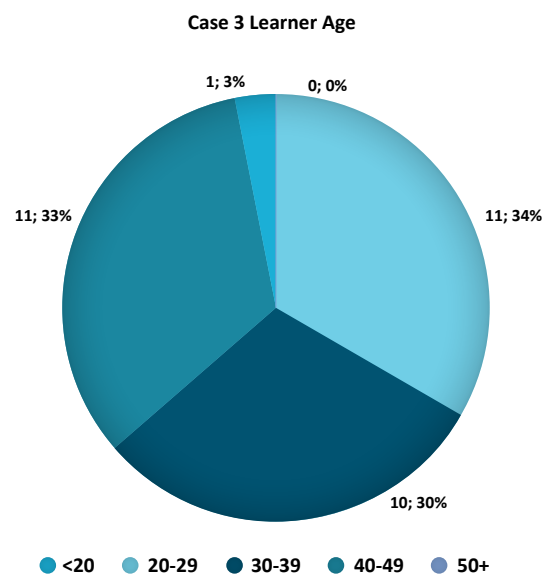


Figure 4.11: Distribution of learner age in Case 3

The age of participants ranged from 22 to 54 years of age, and the mean was 35 years of age. Of the 33 students, 53 per cent were male as shown below in Figure 4.12.

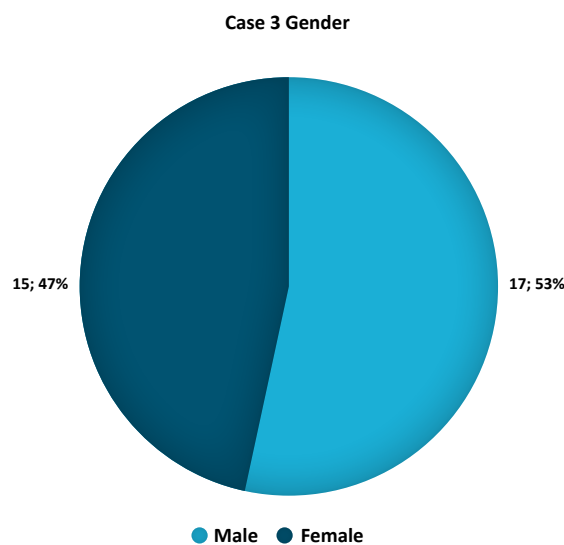


Figure 4.12: Gender distribution for Case 3

Contextual conditions: Textual communication and groups

In Chapter 2, quality in online learning was acknowledged to involve the interplay between a range of contextual and conditional nuances (Swan, 2003). The contextual conditions in this Case were linked to the design of the course, which required learners to communicate textually and to collaborate asynchronously in a large group (n=33). Text assumed the fundamental form of an exchange, in that it represented the dialogue and interaction between communicators. Participation in a series of online activities was assessable and accounted for 10 per cent of the total marks for the course. These activities encouraged learners to: introduce themselves; access and review course resources and links to external material; contribute one post to the discussion forum and respond three times to the posts of others; and to complete the course evaluation at the end of the term. Each activity was individually weighted and scheduled to be completed at different times during the term, for example introductions and student access to course resources was to be completed by the end of week 2. The course promoted learner-content interaction and, to a much lesser extent, learner-learner interaction.

Intervening conditions: Course design and participation

Within this Case, a degree of synergy was discerned between the learning outcomes, learning activities and assessments within the course. For example, the course outcomes related primarily to the application of content knowledge in a workplace setting and incorporated, primarily, individual elements.

- 1 Apply knowledge of anthropometric variation of the human body in relation to work station design (Assessment 2, Practicum) (Individual)
- 2 Discuss the concepts of work capacity and limitation (Assessment 2, Practicum) (Social)
- 3 Assess the physical work environment including thermal, visual, aural and vibration (Assessment 2, Practicum) (Individual)
- 4 Evaluate the efficacy of job design in relation to psychological considerations including attention, awareness, memory, biorhythms and shift work (Assessment 3, Practicum) (Individual)
- 5 Apply the knowledge gained of perception and information processing in the assessment of work station equipment design (Assessment 3, Practicum) (Individual)
- 6 Conduct a worksite assessment and identify appropriate recommendations considering all physical and psychological implications. (Assessment 2 & 3, Practicum) (Individual)

In addition, assessment items 2 and 3, which constituted 90 per cent of the total marks awarded for the course, were to be completed individually, by those enrolled in the course.

In this Case, findings from the learner analytics interrogation are presented in the section below titled Learner Analytics. Following is a qualitative analysis of forum interactions broken into the three interaction types: learner-learner, learner-content and learner-teacher. For each of these interaction types, the data analysis considers patterns, processes and consequences.

Learner analytics

Case 3 was delivered using the Moodle™ LMS at Institution A. The course required students to complete a practicum as a part of their residential school. Students are afforded considerable flexibility in completing this practicum as part of their program of study. As a result, student grades in this Case course are incomplete. Hence grade comparisons for Case 3 are not possible at the time of this publication. Student activity within the LMS for this course has been averaged and compared with the overall Moodle™ average for the other 448 courses delivered in this term, but there are no grade comparisons.

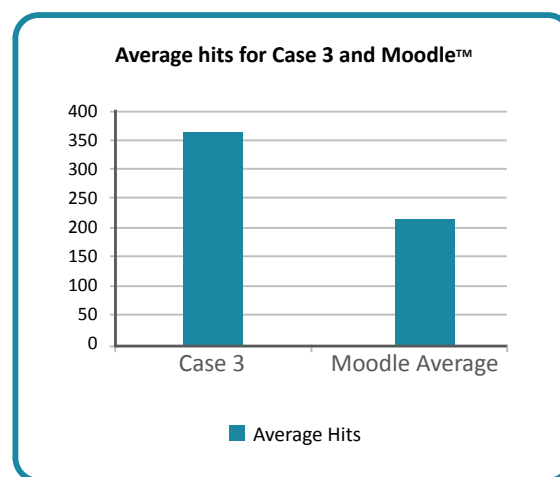


Figure 4.13: Average hits on Moodle™ for Case 3 against Moodle™ average

The average student activity within this Case significantly exceeds the institutional average. For the same term, the Moodle™ average was 219 hits per student across the course of the term. For this course (Case 3) the average was 368, 68 per cent higher than the Moodle™ average. One of the four assessment items for this course required students to introduce themselves using the Moodle™ discussion forums and this may have contributed to the increased level of activity within the course discussion forums. Table 4.9 shows the proportion of the hits on this course that were made within the confines of the course discussions forums.

	Non-forum clicks (hits - dhits)	Forum clicks (dhits)
Case 3	54%	46%
Moodle™ average	65%	35%

Table 4.9: Proportion of clicks within discussion forum areas

The average distribution of activity within the Moodle™ LMS discussion forums for term 1, 2011 is 35 per cent with the remaining 65 per cent in other areas of the Moodle™ site. Forty-six per cent of the Case 3 Moodle™ site activity occurred within the discussion forum with 54 per cent occurring outside this area. This suggests that the use of the discussion forum by students within this course exceeded the average and this could be attributed to the mandatory student forum activity. It could also be indicative of a design and delivery philosophy that promotes learn-learner and learner-teacher interaction although this cannot be ascertained through analytics alone. The following table focuses on the quantity of dhits in the forums, along with the number of posts and replies, as compared with the overall Moodle™ average for term 1, 2011.

	Dhits	Posts	Replies
Case 3	5543	113	369
Moodle™ average	6124	86	147

Table 4.10: The quantity of dhits, posts and replies for all students in Case 3

The average quantity of dhits, forum posts and replies for Moodle™ overall in term 1, 2011 was 6124, 86 and 147 respectively. While for Case 3, the quantity of dhits was less than the Moodle™ average, the number of posts and replies was significantly higher, which points towards a heightened level of forum activity on a per-student basis. Table 4.11 shows the number of learner-learner and learner-teacher interactions, along with the ratio of interaction between these two types as compared with the overall Moodle™ average for term 1, 2011.

	Learner-learner	Learner-teacher	Ratio of LT to LL
Case 3	294	72	0.24
Moodle™ average	86	56	0.65

Table 4.11: Learner-learner, learner teacher interaction in Case 3

Table 4.11 shows a significantly higher degree of learner-learner interactions for this course when compared with the Moodle™ average, revealing a marginal increase in learner-teacher interactions over the Moodle™ average. The interactions, as indicated by the analysis of student activity within the Moodle™ discussion forums are predominately learner-learner. This could be indicative of a course design and delivery philosophy that encourages student community or perhaps simply the students are using the forum as a means to have their questions and concerns addressed. A purely quantitative enquiry using analytics can only provide indicators of what may be happening within the system. The following chart (Figure 4.14) provides a breakdown of the three interaction types across this course.

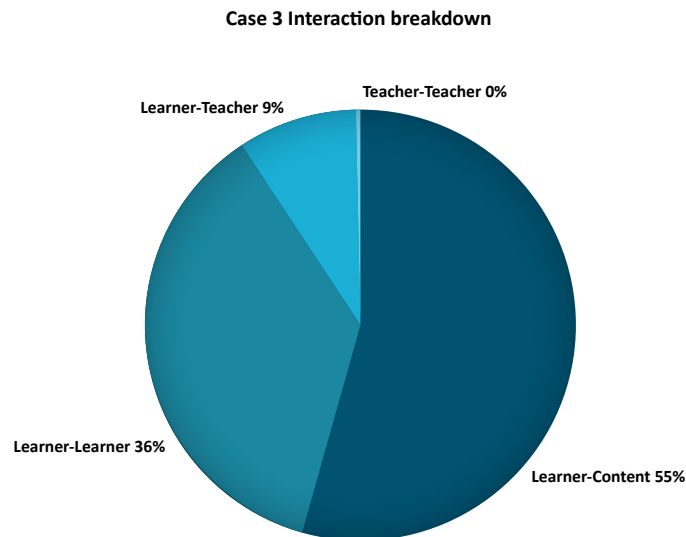


Figure 4.14: Patterns of Learner Interactions in Case 3

Figure 4.14 again suggests that learner-content dominates the interactions within an LMS. Learner-content constituted 55 per cent of the interactions occurring within Case 3, while 36 per cent were derived from learner-learner interactions. Not surprisingly, given the disproportionately high ratio of learner-learner interactions, learner-teacher only accounts for 9 per cent of the interaction within this course.

The following chart (Figure 4.15) is present to provide a point of reference with other courses offered by Institution A in the same term. Similar to Figure 4.14, it is showing the breakdown of learning interactions within the LMS across the 448 other Moodle™ courses during term 1, 2011. Even given the seemingly high level of learner-content interactions within Case 3, when compared with the average across Moodle™, this course has significantly higher degrees of learner-learner interactions.

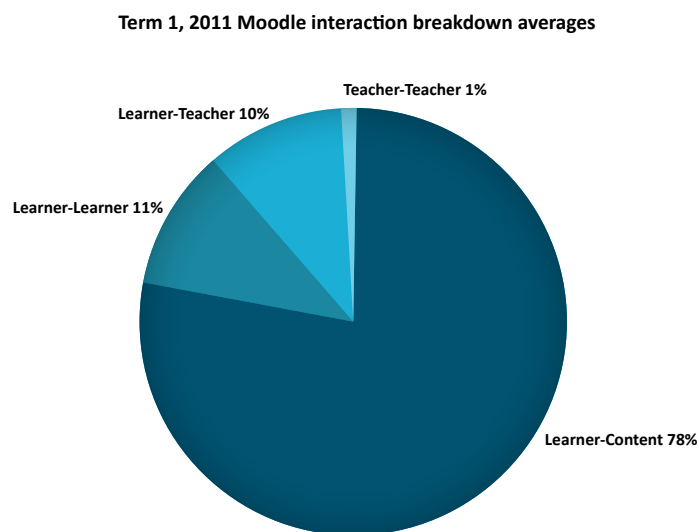


Figure 4.15: Term 1, 2011 Moodle™ interaction breakdown Case 3

Even considering that more than half the student interactions within Case 3 were interactions with content, this course still exceeded the Moodle™ average in terms of learner-learner interactions. This could be indicative of a course design philosophy that encourages learner-learner interactions.

Qualitative analysis

Learner–Learner interaction

In this course, learners were required to introduce themselves: once, in the ‘arrivals lounge’ (worth 3 per cent of the total grade for the course) and then interact with each other by via one post and three replies to the course discussion board before the end of week 6 (worth 6 per cent of the total grade). For this reason, the statistical distribution in respect of learner-learner interaction and learner-content within this course was unanticipated. It is important to note that, in this course, learners were not presented with a series of pre-set collaborative learning activities, as students were in Cases 4 and 5. Rather learners were instructed that their contributions to the discussion board must pertain to the subject matter and add to the discussion of ergonomics content presented in the course.

Appendix A provides a detailed overview of the conditions, intervening conditions, actions/interactions and consequences of learner-learner interaction within this Case.

Processes: Communication strategies and relationship development Communication strategies

The analysis of learner contributions within this course revealed a range of self-initiated strategies, which included the adaptation of text to convey non-verbal communication, specifically the use of bold text, capitalisation and/or emoticons, and the use of humour.

I guess as long as there are humans to use things there will be engineers trying to stop them hurting themselves. The trick is to try and stay one step ahead (no pun intended safety mate). Oh the other one I see a bit is the safety button on the machine held down with masking tape “because its quicker” this from someone who ran over their own foot with a machine, and yep you guessed it, the safety button is designed to make sure the operator isn’t anywhere near the wheels before the machine moves. GOLD.

In this Case, students did not report difficulties communicating in a textual environment, however, there were apparent misunderstanding that were associated with the frequent use of acronyms, by some learners.

Being very new to the world of WPHS I had to ‘surf the net’ to find the meaning of the acronyms.

Hi [student] (AKA Frustrated), I am hearing you I think. The acronyms in your discussion have me stumped as I do not work in industry....

...WMS - Work method statement. Legislative requirement for the construction industry Email me if you want me to send you one of ours (in confidence though please) JSA/JHA/JSEA - all similar to above. Job Safety Analysis, Job Hazard Analysis, Job Safety and Environment Analysis...

In this course, students did not utilise alternative modes of communication and, as a result, it was possible to view all learner-learner interactions.

Relationship development

Although ongoing communication between and among learners was not a requirement of this course, learner-learner interaction was observed to commence 10 days prior to the start of term, continue regularly until week 7 and persist sporadically until week 12. As learners were expected to interact up to five times each (1 introduction, 1 post and 3 replies), the level of learner-learner interaction indicates that learners formed a relationship with each other. Learners were observed making contact with each other, initially through the detailed introductions they posted. They also identified, discussed and explored shared work experiences.

I believe you are frustrated by the lack of employees following simple procedures and risk assessments in performing tasks and then not looking in the mirror for root cause following an incident. I share that frustration in some way in communicating procedures at school on a daily basis.

I share your pain! I believe the holy grail of safety is personal behaviour. We (the organisation) can give them all the systems and processes/procedures in the world but like you said, if they choose not to do/use them they are useless. And this is where, I believe, that behaviour comes into it.

On a personal level, learners responded, often with humour, to the contributions made by others.

Think I might write a book from these replies team. That will be after I write the Quirky Notes from Parents which includes - "Johnnie can't do PE for a week because he has a twisted testicle". Too much info. Maybe Frances' sandblaster should have had a note from his mother saying, "Johnnie can't play with sandblasters because he has slipped discs"... PS: [student] also got me thinking that I don't want her job - one car seat at a time for me! [student] has the old 'after market' issue and I can only suggest to carry some spare fuel (ULP not LPG) and keep your eyes on the road. [student], hide the tape from your workmates. In my own experience with electric tools I recon the switches on grinders are the most dangerous. I know they allow manoeuvrability but the fact they lock on with no automatic off is a hazard for DIYs.

Learners also acknowledged and valued the knowledge and diversity that existed within the group. As a result, students frequently sought and received both work based and course related support.

I am happy to see another power station person here (I am at Millmerran). I hope the upcoming restructure doesn't upset your study plans too much. Look forward to bouncing ideas off someone in the same industry.

Not sure why but generally OHS type forums seem to struggle to be overly active. Maybe people need to be not concerned with their lack of OHS experience as they just may have valid points that those of us in the 'industry' have never thought of. Where did you go to see a list of participants as I have read all the posts but would not mind having a summary somewhere to see who is in the course?

Consequences: Relationships among peers Sense of community

Previous examples from the content of learner contributions to the discussion forum demonstrate the processes through which learners made contact, shared experiences and formed connections within the group. The fact that learners identified themselves as a “team” and invested time interacting with each other beyond course requirements lends support for the observation that learners in the course developed relationships with peers. Moreover, given that a community has been described as a group of individuals who share a common purpose or goal, collaborate to address learning needs and draw from individual and shared experiences in order to construct knowledge and enhance the individual and collective potential of community members, learners in this course could also be considered a learning community. This they achieved within a relatively short period of time.

Knowledge and understanding

Learners in this course had access to and drew from a diverse range of knowledge, they were also willing to share and learn from the industry-related experience of others.

We have a situation at work (which I'm doing as a subject of my assignment) where operators lift rocks for grids. The work instruction requires the operator to put plates over the grid to prevent injury while cleaning the rocks off. Some operators do this but common practice is to balance across the grids and lift. The problem is that there are guard rails along the side of the station so it is easier to walk up the grids than lay tracks using these plates. So we have created a system where one control measure (platform guard rails) has made a secondary and more important safety system difficult. It's easy for us to say “Look you are not following the work instruction” but in reality we have made it difficult for them.

Given the focus upon learner-content interaction within this course, the selection of a social format within the Moodle™ site could be conceived as incongruent, in terms of course design. Yet, in this course, the strategy would appear to have facilitated a positive learning outcome. In this course, it would appear that conditions conducive to knowledge construction stemmed from the interactions that occurred among learners rather than as a result of teacher-learner interaction. This observation is discussed further later in the report.

Learner–Content interaction

In terms of content, students were directed to a series of resources and instructed that contributions to the discussion board must pertain to the subject matter and add to the discussion of the ergonomics content contained within the course. Thus, as in Case 5, learner-learner interaction and learner-content interaction were interlinked.

Appendix A provides an overview of the conditions, intervening conditions, actions/interactions and consequences of learner-content interaction within the Case.

Processes: Reflection, internal negotiation, articulation, social negotiation

The emphasis within this course was upon learner-content interaction. Within the course profile, students were directed to a range of online resources, which were located in course links, learning resources and interesting links areas in Moodle™. A number of students reported difficulties accessing these materials and of feeling overwhelmed by the number of resources they were required to access (Assessment Item 1: Moodle™ activities).

Also some issues with cognitive ergonomics links with the - same link from 2 different places i.e. Decision Making and Displaying and Coding. - the attention link taking you to a music therapy site.

Learners were found to reflect on content, articulate links between content and work-based experience and negotiate understandings with others. The following messages, which are an extract of discussion that occurred in week 1 serves to demonstrate both the nature of learner-learner interaction, reflection on course material and external resources, and the dialogic process through which learners share and construct knowledge.

This book is a really good read! [course resource] In my opinion it reinforces the view that Zero Harm is an ideal which is really not attainable in practice because of the “human factor”. It doesn’t mean we shouldn’t strive to improve our safety record or training, but no SMS can predict how a person will act or react in a particular situation. Comments and debate most welcome!

I find it interesting people advertise ‘Zero Harm’ but when you go and question people what it means, people will argue its meaning and you find it is never the same answer. A few weeks ago I was in a presentation and the Health and Safety Manager of [Employer] asked the question of whether Zero Harm is achievable. Everyone in the presentation (except me) put their hand up saying it is possible. The manager questioned me why I thought it was not achievable and I justified by saying ‘human error’; Then the OH&S manger questioned a mechanic why he thought Zero Harm is achievable, the man could not give an answer and soon changed his mind. At the end of the presentation I walked away understanding the expression/ advertising of ‘Zero Harm’ is about making people think about

safety at an individual level (self level); psychology, targeting self to create a positive safety attitude. By establishing this sort of safety at this level, creates a foundation to creating OH&S safety culture within a workplace.

Consequences: Knowledge and understanding

The length of the learners' posts in the previous excerpts is significant. Students clearly give due consideration to the topic and to the view, experience and perceptions of others. This interest leads to learners documenting, most often in a detailed way, their understanding of the issue ("my understanding"). On occasion there is agreement but also disagreement, which is accompanied by some form of rational argument, based either within experience or in the literature ("your understanding"). Learners rarely drew their discussions to a formal conclusion, however they did negotiate understandings as a result of these discussions ("our understanding") and appreciated the opportunity to debate issues that were important to them in their workplace.

Learner–Teacher interaction

Appendix A provides an overview of the conditions, intervening conditions, actions/interactions and consequences of learner-teacher interaction within the Case. Also included are the processes: learner- teacher interaction, teacher-learner interaction, learning and instruction. While, statistically, the level of learner-teacher interaction in this course is less than that in Case 4, it is based on the number of posts to the course as a whole and is greater than Case 5. In this course, the category of learner-teacher interaction indicates that the majority of learner contributions to the discussion board constituted a response to Moodle™ activities; specifically, the need to post content that added to course content and to engage with the posts of others. Learner requests for assistance within the online site were found to be less frequent than in other courses. On this basis, it is interesting to note that students were found to request further support and expressed dissatisfaction with the level of support that they were receiving and frustration with the speed of the coordinator's response to their requests.

*Hmmm, perhaps this thread is an indication that more support is required??
I am also struggling with where to start - considered doing my assignment on
the ergonomic layout of the dispatcher's work area as it relates to how well he
functions in his role capacity, but doubt that would be classified as "equipment".*

Yet, as the learning and instruction category shows, the predominant subcategory represented was offers of guidance in respect of assessment. In response, the coordinator drew attention to apparent differences between her expectations and those of the learners.

*...I think the issue here is about expectations- mine and yours. To put any discussion
of expectations in context I think it is useful to draw on a couple of*

*facts ... The ...program... sits just above a Bachelor degree which is at Level 7. The
entry requirements as per handbook ... Entry requirements are:*

- a three year Bachelor degree from an Australian university. Consideration may also be given on an individual basis to applicants with:
- professional OHS (non-degree) qualifications or equivalent and who have had at least five year work experience at a middle or higher management level; or
- other relevant qualifications but working towards professional OHS career development.

Students applying for entry via this alternative approach will need to provide and show the ability to:

- write high level reports;
- read and analyse academic literature, government policy texts and create detailed reports; and
- complete high level numeracy tasks applicable to workplace situations.

In response, the student comments;

...If there is an expectation by [Institution] that students “at this level” would “not request or require feedback on draft submissions and that they would be self- directed in using the module review questions as formative assessment of their progress” (your words), I believe that students “at this level” should be informed of that expectation, preferably in the Assessment Guide...

The coordinator also draws attention to the issue of the time that is required to respond to individual questions posed via emails as opposed to a collective response that may also benefit other learners posted to the Moodle™ site.

Towards the end of term (week 11), the course coordinator introduced a new member of staff to the student group.

Hi all You will have noticed the presence of [sessional staff member] in the forums and in your assessment feedback. Over the last couple of weeks I found myself in a situation where I had an unanticipated absence from the campus so that I could deal with an urgent family crisis and then fell ill myself. I am very appreciative that [sessional staff member] was able to step in at the last moment and help me manage my workload at this time. [sessional staff member] is not a stranger to the course. I was able to ask him to urgently assist because he taught in this course last year. [sessional staff member] is also one of my human factors PhD students so I know his skill base and capability with regard to the subject matter. You should have all received your assignment feedback for the Manual Tasks assignment. Please also see [sessional staff member] general feedback as forum post.

Even though students were not required, for assessment purposes, to continue to post contributions beyond week 6, some students were still active within the discussion forum. One student requested, rather tersely, that the sessional staff member introduce themselves to the group.

One thing I have learnt over time is that if your new into a group you introduce yourself. Even on this module it was part of the assessment. Who are you? Tell us about yourself...

To which the staff member replied;

I believe my profile is still visible from when I helped with this course last year. And your profile is all I know about you. But if it helps build credibility with the group I am prepared to discuss some of my relevant past experience...

Consequences

The conditions and intervening conditions (teacher-learner interaction) in this Case contributed towards the construction of knowledge through reflection, internal negotiation, articulation and social negotiation. Of note, however, is the dissatisfaction expressed by learners around the levels of support they perceived themselves to receive and the presence of some antagonism between teaching staff and learners within this course. Conflict did, however, occur among learners, discussed in Case 5. Given that this consequence had not occurred within previously analysed cases, further investigation was undertaken in an attempt to ascertain particular differences that may provide insight as to why conflict of this type was observed within this course.

On reviewing the nature of teacher-learner interactions, distinct differences were to be found. In this Case, the subcategories included, posts about teacher availability, the introduction and presentation of self, expectations and credentials and acknowledging feelings and concerns. By contrast, although not in the same order, the subcategories within Cases 5 and 2 were: offers of praise and encouragement; acknowledging feelings and concerns; inviting self-determination; and provision of support. Comment has already been made about the consequence of these interactions, in as much as they were believed to set the tone and create conditions that were conducive to interaction and knowledge construction, in Case 5 and to knowledge construction, in Case 4. The absence of similar types of interaction from the teacher in Case 4 may have had a detrimental effect on student satisfaction and given rise to the conflict that occurred.

Summary of quantitative Analysis - Case 3

- The quantity of student activity within this course exceeds the institutional average.
- The quantity of student activity that occurred within the discussion forums is less than the institutional average in terms of actual quantity, but significantly more in terms of per-student.
- The ratio of learner-learner interactions that occurred within this course significantly exceeds the institutional average.
- A majority of the learning interactions that occurred within this course were learner-content interactions.

Summary of qualitative analysis–Case 3

Table 4.12 summarises key elements associated with this Case. In this course, the course design (conditions and intervening conditions) promoted both learner-learner interaction and learner-content interaction in equal measure up until week 6 of the course. These conditions had a positive impact on the ways and the extent to which learners participated and engaged in learner-learner and learner-content interaction. Even though the expectation was that learners contribute one initial post and three responses engaging with the content of others, learners responded more frequently to the posts of their peers and continued contributing in a meaningful way beyond the six-week requirement of the course. In this course, a degree of learner dissatisfaction was discerned within the discussion board. There was also a question of expectations in relation to the academic ability of learners enrolled in this course. As conditions of entry into the educational program gave consideration to work-based experience and knowledge, it would appear important to make explicit expectations and/or provide some initial guidance as learners make the transitions from work-based positions so that they may better be able to fulfil academic requirements.

Case 3		Units of analysis	Processes	Consequences
Conditions	Textual communication	Learner-learner	Communication strategies Relationship development Contact Involvement Intimacy	Creates conditions conducive to learner interaction and knowledge construction Relationships among peers Sense of community Acknowledgement & value diversity Knowledge and understanding
Intervening conditions	Course design			
Participation assessed				
Conditions		Learner-content	Knowledge construction and reconstruction Reflection Internal negotiation Articulation Social negotiation	Knowledge and understanding My understanding Your understanding Our understanding
Intervening conditions				
Conditions		Learner-teacher Teacher-learner	Learner-teacher interaction Seek information guidance and support Respond to/participate in learning activities Request further support Teacher-learner interaction Availability Presence and presentation of self Expectations and credentials Acknowledges feelings and concerns Learning and instruction Offers guidance re assessment Provides direction or access to course resources Rationale for content & approach Questions or probing	Dissatisfaction with level of support Knowledge and understanding (course design) Reflection Internal negotiation Articulation Social negotiation
Intervening conditions				

Table 4.12 Key elements of Case 3

4.4 Case 4

Case 4 studies an undergraduate course in Journalism using the Moodle™ LMS. This section provides a quantitative analysis of the course, followed by a qualitative analysis.

Course structure and design: Synopsis, learning outcomes, learning activities and assessment

This Case was an undergraduate course within the discipline of Journalism. The course was described within the handbook and course profile as a flexible delivery offering. The mode of delivery was on campus or online, only students who enrolled and completed the online offering of the course were included in this study.

The course synopsis stated:

An understanding of the relationship between media and public relations is vital to the success of raising and maintaining a public profile for an organisation. This course introduces students to media management theories and concepts, and teaches students skills that form the basis of media liaison. These include writing press releases, preparing talent, targeting effective media, and knowledge of the difference between print and broadcast media practice. By the end of the course, students will be expected to have enough understanding of media practice to be able to develop strategies for using the media to support public relations activities and an organisation's goals.

Learning activities

In this Case, the learning management system used to both administer and deliver the course was Moodle™. Course content was structured around the 12 week term and presented in a weekly format. Students were informed, within the course profile, of the expectation that they would engage with the course materials, staff and other students in a way that encourages peer review and reflection upon personal knowledge and professional practice. Learners were specifically instructed to respond to a minimum of five study guide activities during the term. In this course, educational emphasis was placed upon learner-content interaction and, to a lesser extent, learner-learner interaction.

Assessment

There were four assessment items associated with the course. Each assessment item was individually weighted:

There was no formal examination for the course.

Participants

Participants were students who had enrolled in and completed the undergraduate online course. The course was a first year unit of study within a professional communication degree and an elective in one other undergraduate program. Learners who participated in this study were enrolled in two different undergraduate programs.

Participants consisted of 31 students and one course co-ordinator, responsible for managing the course during the academic term. The age of participants ranged from 17 to 46 years of age, the mean was 24 years of age, as illustrated in Figure 4.16.

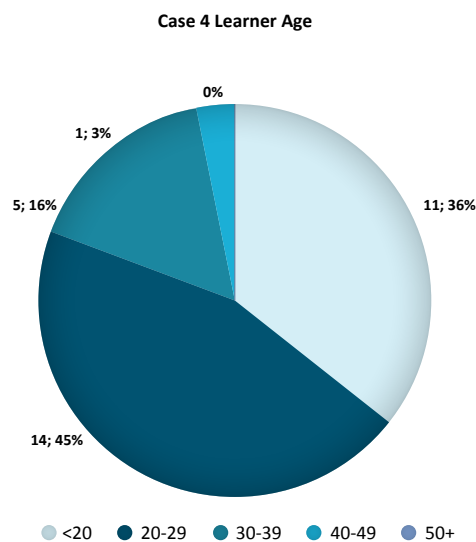


Figure 4.16: Distribution of learner age in Case 4

Of the 31 students, 16 per cent were male, as illustrated in Figure 4.17.

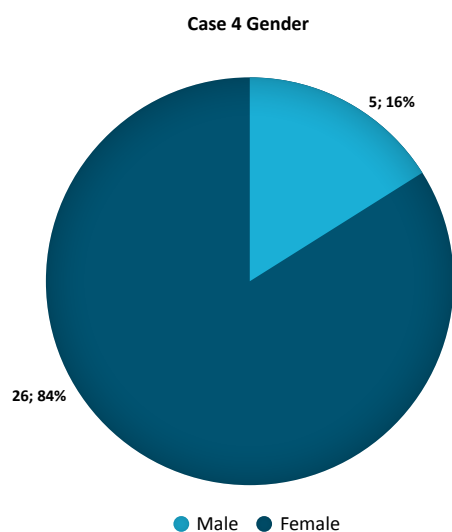


Figure 4.17: Gender distribution for Case 4

The distribution of grades for Case 4 is shown in Figure 4.18.

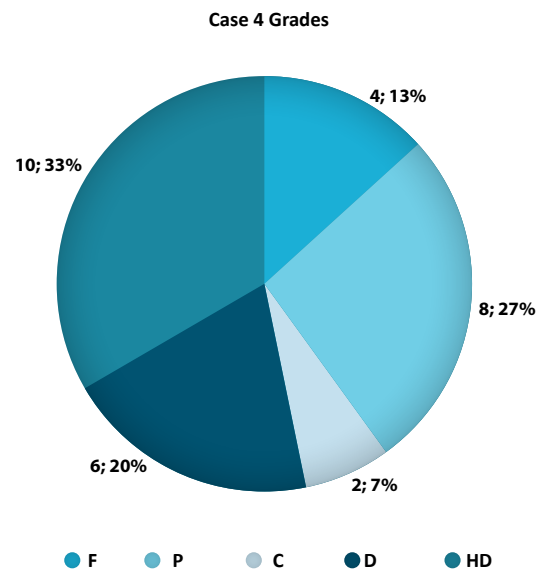


Figure 4.18: Grade distribution for Case 4

Contextual conditions: Textual communication and groups

The contextual conditions in this Case, as in Case 3, were linked to the design of the course, which required learners to post textual responses to learning activities to a large group discussion forum. Students were also encouraged to collaborate, in small groups to complete assessment items 2, 3 and 4.

Course engagement was weighted at 20 per cent of the total mark for the course. It was anticipated that students would engage with course materials, staff and peers in a way that stimulated peer review and reflection on personal knowledge and professional practice. Students were not required to complete each of the weekly activities but to complete a minimum of five. Assessment 1, which related to course engagement, necessitated student selection and submission of what they considered to be their most well-considered responses with justifications as to how the activity and the response contributed to the students learning within the course.

Intervening conditions: Course design and participation

Within this Case, a degree of incongruity was discerned between the synopsis, learning outcomes, learning activities and assessments within the course. For example, the synopsis and learning outcomes emphasised student autonomy, individual knowledge and personal understanding, while at least one activity each week and all assessment items promoted learner interaction and student collaboration. The outcomes for this course can be seen to relate to individual learning outcomes:

- 1 Know basic traditions and history of the relationship between public relations and media in Australia (Individual)
- 2 Be aware of the role and context of media manager or media liaison officer within an organisation (Individual)
- 3 Be able to view 'journalism' from a public relations, and more specifically, media management perspective (Individual)
- 4 Understand the journalist's and the media manager's role in relation to an issue, and be able to determine your own/organisational goals when dealing with the media (Individual)
- 5 Be able to prepare key messages, and utilise them confidently when conducting media interviews, or preparing talent to be interviewed by media (Individual)
- 6 Be able to write clear and concise press releases to the specifications required by the media (Individual)
- 7 Have enough understanding of media practice to be able to develop strategies for using the media to support public relations activities and an organisation's goals (Individual)

Student participation (course engagement), in this Case, was measured by the submission of five of the students best posts. Assessment items 2 and 4 could be submitted either individually or by a group. In the Case of assessment 2, individual submissions would receive fewer marks than those submitted as a group, therefore group submission was actively encouraged. Students could choose to submit assessment item 4 as an individual or group, and no conditions were attached to the award of student marks. As in Case 5, learners could determine for themselves the extent to which they would interact with content, peers and others. As a result participation was only partially determined by the course design and was therefore recognised as an intervening condition in this Case.

In this Case, findings from the learner analytics interrogation are presented in the section below titled Learner Analytics. Following is a qualitative analysis of forum interactions broken into the three interaction types: learner-learner, learner-content and learner-teacher. For each of these interaction types, the data analysis considers patterns, processes and consequences.

Learner analytics

Like Case 3, this course (Case 4) was delivered using the Moodle™ LMS that was adopted in 2009. The following chart (Figure 4.19) shows a comparison of student activity in each grade group between this course and the other 448 courses delivered term 1, 2011 to distance students.

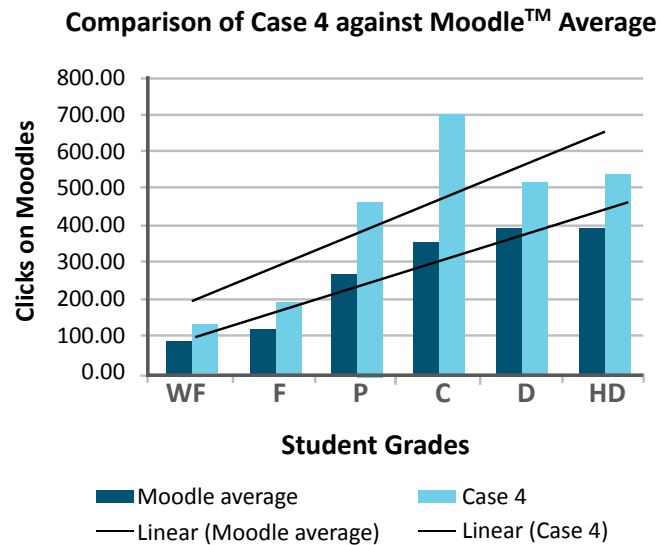


Figure 4.19: Average hits against grade for Case 4

From the chart, the average number of hits for each student in this course exceeds the average for all other Moodle™ courses offered in the same term. The Moodle™ average was calculated from 448 Moodle™ courses with a total of 38,049 student course combinations. This course (Case 4) was chosen due to its above average student activity within the LMS discussion forums and this is evident in the higher than average level of student activity within the course site. The following table (4.13) further demonstrates how this course differs from the average Moodle™ course by showing what proportion of student hits occurred within the Moodle™ discussion forums. This could be seen as an indicator of how prominent forum discussions were in the delivery of this Moodle™ course.

	Non-forum clicks (hits - dhits)	Forum clicks (dhits)
Case 4	39%	61%
Moodle™ average	65%	35%

Table 4.13: Proportion of clicks within discussion forum areas

Table 4.13 shows that 61 per cent of student hits within the Moodle™ site were made within the discussion forums as opposed to 39 per cent across the other Moodle™ courses for the same term. This would suggest that class discussion was an important element in the design and delivery of this course compared with other Moodle™ courses in the data set. While Table 4.13 shows the proportion of clicks within Moodle™ that occurred in the discussion forums, Table 4.14 focuses on the quantity of dhits in the forums, along with the number of posts and replies, as compared with the overall Moodle™ average for term 1, 2011.

	Dhits	Posts	Replies
Case 4	8801	62	521
Moodle™ average	6124	86	147

Table 4.14: The quantity of dhits, posts and replies for all students in Case 4

Table 4.14 shows that the total number of dhits in this course exceeds the average for Moodle™ as a whole. The number of posts is below average while the number of replies to these posts is well above the Moodle™ average. Note that the figures above are not calculated per student but are simply the totals for each category. This course has a below average number of students, and this would suggest that on a per-student basis, forum activity was significantly higher than average. The number of replies and the total number of dhits would indicate an above average amount of forum activity is occurring despite the below average amount of initial discussion forum posts. This could be indicative of question and answer style forum activity where the students are responding to prompts from the teacher or other students. The following table demonstrates this by breaking down the forum activity into the number of learner-learner and learner-teacher interactions, along with the ratio of interaction between these two types as compared with the overall Moodle™ average for term 1, 2011.

	Learner-learner	Learner-teacher	Ratio of LT to LL
Case 4	217	278	1.28
Moodle™ average	86	56	0.65

Table 4.15: Learner-learner, learner teacher interaction in Case 4

Table 4.15 shows remarkably high levels of learner-learner and learner-teacher interactions when compared with the Moodle™ averages. Learner-learner interactions are more than twice the institutional average, which is indicative of learners responding to the forum posts of other learners. Furthermore, the number of learner-teacher interactions is more than four times the institution average for the same term. This would suggest that most of the student activity in the discussion forums was students responding to the posts of the teacher. Figure 4.20 shows the breakdown of learner-learner, learner-teacher and learner-content interactions for Case 4.

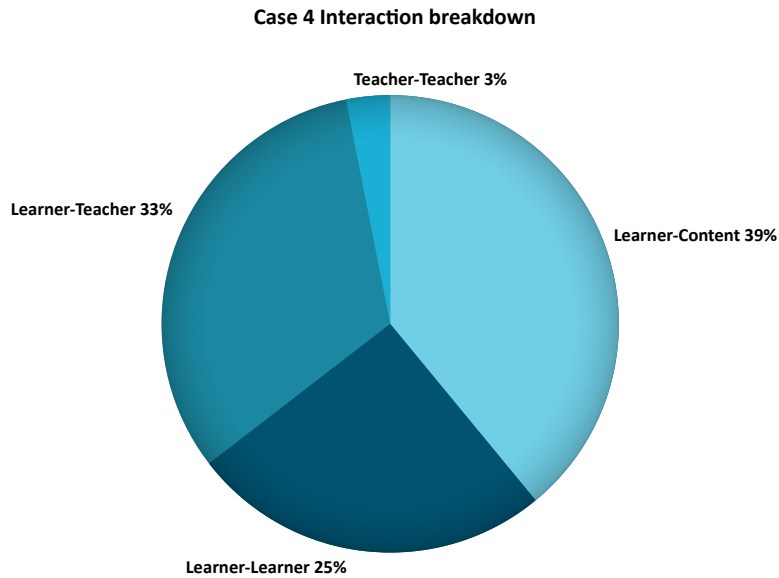


Figure 4.20: Interaction types within Case 4

Figure 4.20 reveals quite a balanced apportioning of interaction among the three interaction types. Of all cases, Case 4 has the highest level of teacher-teacher interaction. There was only one teacher engaged in this offering of the course, therefore, the teacher must have responded to their own messages in the discussion forum. This often occurs when the teacher has more time at a later stage to provide a more detailed response to the discussion forum. Figure 4.21 provides a point of reference with other Institution A Moodle™ courses during the same term offering. Similar to figure 4.20, it shows the breakdown of learning interactions within the LMS across the 448 other Moodle™ courses during term 1, 2011.

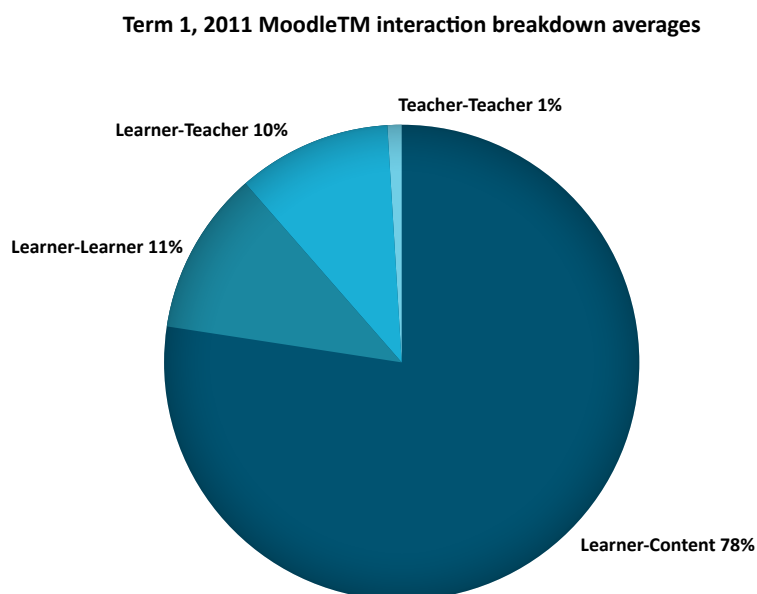


Figure 4.21: Term 1, 2011 Moodle™ interaction breakdown averages

Figure 4.21 shows the predominance of learner-content interactions compared with Case 4. On average, Moodle™ courses in term 1, 2011 were dominated by learner-content interactions with 78 per cent of course activity falling into this category. This highlights the atypical design and delivery strategy employed by the teacher of Case 4, where the ratio of learning interactions is dominated by learner-learner and learner-teacher interactions.

Qualitative analysis

Learner–Learner interaction

In this course, continued engagement within the large group throughout the 12-week term was not essential. Assessment item 2 could be submitted either individually or as a group; however, students were advised that individual submissions would receive fewer marks than those submitted as a group, therefore, collaboration with peers in small groups was actively encouraged. Students could also choose to submit assessment item 4 individually or as a group; no conditions in respect of the award of student marks were documented within the course profile. The course coordinator promoted the use of synchronous forms of communication such as chat and/or Skype for small group discussions. Conversations among learners who used this mode of communication were unavailable for analysis within this study.

Appendix A provides an overview of the conditions, intervening conditions, actions/interactions and consequences of learner-learner interaction within this Case. While Appendix A, Case 4 acknowledges the use of synchronous discussion by learners, the categories themselves are derived from the analysis of asynchronous interactions between and among learners in large and small groups. Data for this analysis was collected from the electronic archive of the course. In addition a number of students posted drafts versions of the collaborative assessment items as an attachment within small group discussion forums. These documents were also unavailable for analysis but are acknowledged within Appendix A, Case 4 via the category ‘our understanding’.

Processes: Communication strategies and relationship development Communication strategies

It became apparent that students within this course utilised a diverse range of communication tools in addition to the discussion forums made available to them via the LMS and the suggestions offered by the course coordinator.

Sorry it has taken me so long to reply.. I have been away for a week or so... but am back and ready to go now...again very sorry... I would love to have some contribution to this assignment, I do not have skype but have face book which is probably the best way of contacting me or through my work email

Analysis of the posts that were observable within the LMS revealed the use of bold text, capitalisation and emoticons.

...here is the link to the case study Case study... NEED TO ENSURE WITH THE ABOVE POINTS THAT THEY ARE ONES THAT CAN BE MEASURED. PLEASE REFER TO THE NOTES PROVIDED PREVIOUSLY Strategy: relates to what media channels are going to be used for EACH objective Please refer to the rest of my notes for other info.

Students also expressed distress that they associated with their educational workload.

Oh god I am so burnt out from all the work this term arggggghhhh. Ok just having a moment....ummm so who would like to work on what?

Although students in this Case did not discuss particular difficulties with textual misunderstandings it became apparent that some small groups did experience problems connecting with one another.

...it seems it is difficult for both of us to contact one another online, so perhaps talking directly on the phone may be a bit more productive. I think discussing this over the phone will allow us to sort out a plan of action.

Stupidly I have been replying via email not on the Moodle™ forum. However I have been following the conversation, sorry that it has taken me so long to realise that you guys haven't been getting my messages.

Learner-learner interactions within this course indicate that in this Case learners used a diverse range of methods to communicate with each other, some of these were not text-based—for example, face-to-face and Skype—others chose textual methods other than the LMS—for example, phone texts and email. These courses of action enabled learners in small groups to formulate their own communication strategies but, in the main, the choices made meant that the processes and outcomes of learner-learner interaction were not always observable by the course coordinator or the researcher in this study.

Relationship development

In this Case, learner-learner interactions within the large group discussion board did not contribute towards the formation of relationships between and among students. For the most part learner contributions to this forum reflected individual responses to weekly learning activities. Despite the fact that students did not engage with the posts of others, a number of them did post their submission as a reply to the post of another student, this would be misrepresented as learner-learner interaction in the analytic analysis. This was not the case within small groups.

The majority of learners chose to complete assessment 2 as a member of a collaborative group. Small groups were established, by the course coordinator at the beginning of the academic term, assessment 2 being due at the beginning of week 6. Upon completion of this assessment, students were offered an opportunity to continue with or remove themselves from existing groups.

You are welcome to stay in your groups for your final assignment, or you can work solo. Please let me know what you wish to do in due course.

The majority of learners opted to remain together and indicated that they were satisfied with the process and outcome of their collaborative efforts. Example messages to this effect include the following.

[Student], [Student] and I are keen to stay in the same group (Group A). We have not heard from [student] yet but happy for him to be a part also if he wants.

We were group B and would like to stay together for this next assignment.

Others, however, did not share the same positive experience and were subsequently relocated to a different group.

...I have been left high and dry by all the members in my group...I am very pleased to have a group who is productive and I hope you will find I am a good addition to your group. I will definitely work very hard to get the best grade for the entire group. The thought of doing this assignment alone was very daunting.

The model constructed to illustrate the stages of relationship development in online contexts in Case 5 also explains the process of relationship development within this course. It is apparent, as it was in Case 5, that not all learners experienced each stage and phase as depicted within the diagram, but that each stage and phase was apparent within this course (contact, involvement, intimacy, deterioration, repair and dissolution).

Consequences: Relationships among peers

Despite the fact that there was evidence of connections between learners and reciprocal offers and receipt of emotional and material support, there was no evidence to suggest that learners had achieved or experienced a sense of community within the groups.

Looks great guys, well done to everyone, i only spotted one thing other than what [student] mentioned earlier, i have highlighted it. its just some feedback that was posted...i didnt delete it because i thought you might want to have a read of it and make sure the above was done correctly. But apart from that im very happy :) Thanks for being a good team

The sentiments expressed by students in this course would suggest that, in this Case, learners developed a working relationship previously defined by Gabarro (1990) as one that is task-based, non-trivial and one of continuing duration (in this Case over a 12 week term).

Within the large group discussion forum, student posts consisted primarily of individual responses to weekly learning activities. There was little evidence of learners engaging with the contributions of others. The consequence of this was frequent articulation of individual understandings ('my understanding').

As each group submitted a collective response to assessment item 2 and 4, it is apparent that learners also arrived at a collective understanding ('our understanding'); however, the process by which this understanding was reached could not be ascertained due to missing data in this Case.

Learner–Content Interactions

Appendix A provides a detailed overview of the conditions, intervening conditions, actions/interactions and consequences of learner-content interaction within the course.

Processes: Reflection, articulation, social negotiation

In this Case, weekly learning activities were tasks that required learners to review readings or resources and to make notes or post responses to the large group discussion board. In addition, the course coordinator posted a reading or topic for debate or discussion on the Course Discussion Forum. Responses to these activities or exercises could be included as part of the learners course engagement submission in week 10. Learning activities addressed a range of content related topics, such as: the role of reporters, the strategies used in media campaigns or writing a media messages. Two of the three activities developed for week 1 were presented in the following way;

Course Engagement Exercise 1-2

Pick one day where you have time to immerse yourself in news and current affairs. Spend the day watching Sunrise/Today, then read ABC Online, some local and national papers and, then at night, watch local news, national news, national current affairs, world news and maybe something like Lateline. Make notes on the following:

- What seems to be an 'issue' as opposed to 'news'?
- Why do you think this?
- Are journalists 'reporting' or 'commenting'?
- If someone is being interviewed, how much research appears to have been done by the interviewer?
- When being interviewed, what's behind the subject (logos/banners/people)?
- Does the news appear staged or is it an 'as it happens' event?

Course Engagement Exercise 1-3

Each week, the Course Coordinator will post a reading or topic for debate or discussion on the Course Discussion Forum, and your response to this may be included as part of your Course Engagement submission in week 10. You should respond to this within the Course Discussion Forum > Week Discussion.

Within the Discussion Forum the initial post from the course coordinator stated:
This week we're considering the basics of public relations and the media, and you have a couple of course engagement exercises from which to choose. I will also post a topic for discussion each week, and you may select this as your course engagement activity.

Obviously, natural disasters have been in 'the news' for some months now. Last Wednesday, Jonothan Holmes wrote an interesting piece for 'The Drum', in which he states: "Surely anyone with a true need for information can access it through official channels?" The media is not here to help. It does not feel your pain: <http://www.abc.net.au/news/stories/2011/02/23/3146945.htm> Many of us have been affected in some way by floods/cyclones/bushfires over recent months. With each natural disaster, there are a number of organisations (disaster response units, military, government) that are interacting with the media in a number of ways (press conferences, using Twitter/Facebook). Are there any that you feel have been particularly effective, and why? I, for one, was really interested in how the Queensland Police Service used Twitter during Cyclone Yasi, and how these updates were considered official sources by traditional media. Post your response as a reply, and I'll look forward to hearing some of your views.

Responses to the large discussion board throughout the term contained a diverse mix of student replies to different course engagement activities. Student responses to discussion topics tended to be presented as an individual opinion that was, on occasion, supported with a reference to a reading or an external resource. There was, however, minimal interaction among learners about the subject matter. Thus, in this course, learner-content interaction was observed as the articulation of learner reflections on readings or course material.

After reading McNamaras 2001 paper and Cooks 2005 blog I have established a better understanding of the differences between Journalism and PR. Although both professions coincide with each other, without one there wouldn't be the other. PR practitioners derive positive information about the company and organise events to paint the particular company in a positive light where journalists report the information to the public.

In this Case, social negotiation was not observed within the electronic transcripts, retrieved from the LMS; however, it clearly occurred as learners indicated in their small group contributions that they did meet using various means to discuss the format and the content of small group submissions in respect of assessments 2 and 4.

We had a quick chat in class today and are trying to decide on what topic to focus on I agree that we book in a group meeting

Consequences: Knowledge and understanding

The learning outcomes in this Case placed emphasis on individual knowledge and understanding. Similar emphasis was evident within the course engagement exercises that were embedded

within the online course. Each week these individual activities preceded the discussion topic posted by the course coordinator. The structure and order of activities may have some significance because in this course learner-learner interaction and learner-content interaction was found to be primarily task orientated. This outcome differs from that of Case 5. In this Case, learners exhibited evidence of 'my understanding' through their posts to discussion boards. Although there was little evidence of social negotiation within learner contributions, the submission of a collaborative piece of work constitutes an artefact representative of a process that led to 'our understanding'.

Learner–Teacher interaction

Statistically, the ratio of learner-learner and learner-content interaction and learner-teacher interaction within this course appears more evenly distributed than in Case 5. However, attention has already been drawn to the practice of learners who submitted individual posts as a reply to a previous contribution, which would have an impact upon the outcomes of the quantitative analysis within this Case. In addition, each of the coordinators discussion topics was posted as an initial contribution within weekly discussion forums, which would also have an impact upon learner-teacher statistics.

Processes: Learner– teacher interaction, teacher-learner interaction, learning and instruction

Based on previous research (Rossi, 2010), it was deemed important to differentiate between learner-teacher and teacher-learner interaction. Appendix A provides a detailed overview of the conditions, intervening conditions, actions/interactions and consequences of learner-teacher interaction within this course.

In this course, the nature of learner-teacher interactions reflected the same concerns as those of learners in Case 5,; they related to requests for information, guidance and support, and learner responses to course engagement activities. Offers of praise superseded any other affective form of interaction. Similarly, offers of guidance in respect of assessment predominated within the list of different approaches to learning and instruction. That said, in the previous Case, this advice also corresponded to feedback in respect of learner contributions to online discussions, which was not as prominent in this Case (please refer Appendix A). It is important to note that, although comparisons have been drawn between the types of teacher-learner interaction and approaches to learning and instruction, the incidence within each course was not equal.

Consequences: Knowledge and understanding

In this Case, the nature of teacher-learner interactions was conceived to set the educational tone and create a climate that was conducive to the construction of knowledge. The course emphasised the articulation of individual knowledge and understanding and collaboration in small groups in preparation for assessment 2 and 4. In this course, learners were encouraged to make use of a wide range of communication tools, some of which were external to the

online course. This approach, which appeared convenient for some students, reduced both the coordinator's and the researcher's ability to observe how learners interacted with one another and the processes that they used to construct shared knowledge and understanding. As a consequence learners, in this Case learners were observed reflecting on particular readings, articulating personal understandings and assumed to engage in (social negotiation) as a result of group submission of assessment items.

Summary of Quantitative Analysis - Case 4

- **The quantity of overall student clicks within this course exceeds the institutional average for this LMS.**
- **The quantity of student clicks that occur within the confines of the course discussion forum exceeds the institutional average in terms of proportion and quantity.**
- **The ratio of learner–content interaction within this course is far below the average for this LMS and this is indicative of a course design and delivery model that varies from the average.**
- **While learner–teacher interactions featured prominently in this course, a majority of the interactions exhibited by students were learner–content interactions.**

Summary of qualitative analysis–Case 4

Table 4.16 summarises key elements associated with this Case. In this course the course design (conditions and intervening conditions) resulted in an observed predominance of learner–content interaction. These conditions also had an impact on the ways and the extent to which learners engaged with each other. The development of relationships among peers, in this Case, led to the formation of task orientated, working groups. Within this course, the role of the educator was important in setting the tone and creating an environment that was conducive to the construction of knowledge.

Case	Units of analysis	Processes	Consequences
Conditions Textual communication Large and small groups Intervening conditions Course design Participation assessed	Learner–learner	Communication strategies Asynchronous/synchronous Adaptations Relationship development Contact Involvement	Relationships with peers Task orientated interactions Knowledge & understanding My understanding Our understanding
Conditions Intervening conditions	Learner–content	Knowledge construction and reconstruction Reflection (on content) Articulation Social negotiation (group assessment)	Knowledge and understanding My understanding (discussion board) Our understanding (group assessment)
Conditions Intervening conditions	Learner–teacher	Learner–teacher interaction Seek information guidance and support Respond to learning activities Teacher–learner interaction Offers praise or encouragement Invites self determination Acknowledges feelings and concerns Provides support Learning and instruction Guidance re assessment Direction or access to resources Explains or links to different concepts Questions/probes	Conditions conducive to learner interaction and knowledge construction Knowledge and understanding Reflection Articulation Social negotiation

Table 4.16: Key elements of Case 4

4.5 Case 5

Case 5 studies an undergraduate course in Health and was delivered using the Blackboard™ LMS. This section provides a quantitative analysis of the course, followed by a qualitative analysis.

Course design: Synopsis, learning outcomes, learning activities and assessment

This Case was an undergraduate course within the discipline of health. The course was described within the handbook and course profile as a flexible delivery offering. The mode of delivery was online.

The course synopsis stated

Communication is pivotal in gaining effective health outcomes and as a health professional you are required to develop a broad range of personal, therapeutic, organisation and educational communication skills. Within this course, you will explore communication from a personal, interpersonal and professional perspective. You will be introduced to theoretical concepts, encouraged to reflect upon your communication needs, strengths and weaknesses and provided with the opportunity to develop and enhance your personal and professional communication skills. This course is offered online; therefore, it is a requirement of enrolment that students have regular access to a computer equipped with an Internet connection and a Web browser (Netscape Navigator or Internet Explorer). You will also require basic computer and Web skills, such as opening, closing and saving files and attachments.

Learning activities

In this Case, the learning management system, used to both administer and deliver the course, was Blackboard™. Course content was structured around the 12 week term and presented in a weekly format. Students were instructed, within the course profile, of their need to engage with course content and to complete individual and group activities throughout the 12-week term. In this Case, educational emphasis was placed, upon learner-learner and learner-content interaction.

Assessment

Three assessment items were associated with the course and each assessment item was individually weighted. To pass the course students were required to achieve a pass grade for assessment 1, which was directly related to weekly learning activities, and an accumulated pass based on the marks awarded for assessment 2 and 3, which were individual pieces of work. There was no formal examination for the course.

Assessment item 1: Individual and Group Activities	25%
Assessment item 2: Critical Incident Analysis	25%
Assessment item 3: Critical Reflection	50%

Participants

This Case course was a first-year unit of study within a Health Promotion degree and an elective for several different programs. Students who completed this course were derived from eight different undergraduate programs.

Participants consisted of 20 students and one course co-ordinator who was responsible for managing the course during the academic term. Of the 20 students, 10 per cent were male. Figure 4.22 shows the gender distribution of students for this course.

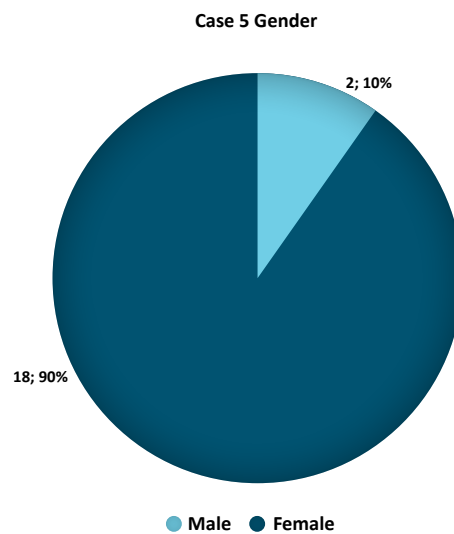


Figure 4.22: Gender distribution for Case 5

The overwhelming majority of students in this offering of the course were female. The age of participants ranged from 19 to 61 years of age, with a mean of 32 years. Figure 4.23 shows the distribution of student ages within this course.

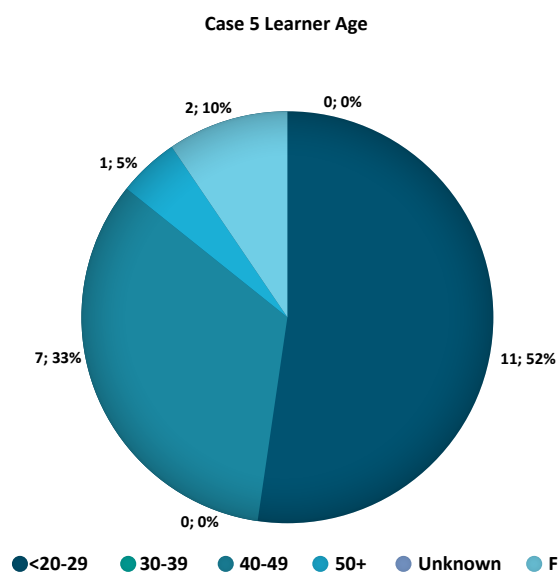


Figure 4.23: Distribution of learner age in Case 5

Figure 4.24 shows the grade distribution for Case 2.

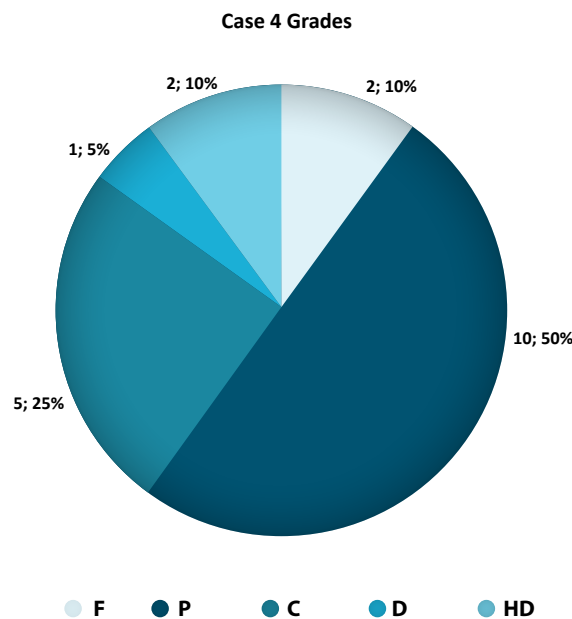


Figure 4.24: Grade distribution for Case 5

The course has a high proportion of Pass (P) awarded students.

Contextual conditions: Textual communication and groups

The contextual conditions in this Case were linked to the design of the course, which required learners to communicate textually and to collaborate in groups of different sizes asynchronously and synchronously to complete learning activities. In these contexts, text assumes the fundamental form of an exchange, in that it represents the dialogue and interaction between communicators. Participation was an assessable component of the course and 25 per cent of total marks were awarded for learner participation in large group, small group and individual activities. Activities encouraged learners to reflect on personal experiences, demonstrate their understanding of the connection between experience and theoretical content and to comment, constructively, on the contribution of others, by providing reasoned rationales for their perspective. The educational aim was to promote critical reflection and to expose individuals to a range of different experiences, thoughts and understandings which may enhance their learning and understanding.

The relationship between learner perceptions of the learning context and approaches to learning is recognised as important within extant literature (Meyer & Muller, 1990) and the findings of this study support previous research in this regard. Textual communication offered learners with opportunities not available in traditional classrooms, because it provided a forum for uninterrupted speech, a reduction in physical noise and time to reflect, prepare and review thoughts before engaging in discussions with others.

Within this Case, the need to communicate textually in groups presented learners with a number of social and educational challenges, which led them to implement a range of self-initiated communication strategies. Through these strategies, learners were able to overcome many of the difficulties they encountered within the online context.

...When communicating online I can assert myself more, and I have time to think about my response and not sound like a goof, if I say something stupid because I haven't thought about it...

Participation in collaborative learning activities and learner-learner interaction in what was perceived to be a safe environment promoted the development of relationships among peers in different learning groups. Although the connections among members of small groups were considered stronger than those in the large group, the large group offered learners diversity and access to a wide range of resources and support. Within the online context, the open and textual relationships among peers promoted a sharing dialogic approach to the construction and reconstruction of knowledge; the consequences were a sense of community, increased knowledge and understanding of self and others, and examples of personal and collective transformation.

I was surprised that a group could form and actually complete tasks to a reasonable level of proficiency in this online environment. I particularly enjoy the collaboration sessions and find by bouncing ideas off each other and sharing experiences we really open up and explore the concepts that make up our study material. I also find the larger class discussions interesting insightful and even the miscommunications can be a little entertaining if you look at it that way. The experience of being part of a study group online has been new and exciting, and has helped me to put into practice much of the theory within study materials. I will use all of the knowledge gained and am exploring these concepts within present and future...interaction.

Intervening conditions: Course design and participation

Within this Case, a degree of synergy was discerned between the synopsis, learning outcomes, learning activities and assessments within the course. For example, the synopsis makes explicit the reflective component of the course and the learning outcomes and weekly learning activities incorporated both individual and social elements:

1. discuss the multifaceted and multidimensional nature of communication (Social)
2. demonstrate self-awareness in relation to your ability (Individual) to communicate with others (Social)
3. describe the characteristics of effective groups (Individual) and participate as a member of a problem solving team (Social)
4. identify (Individual) and discuss the personal and professional communication needs of individuals and groups (Social)

5. analyse and evaluate the impact of factors that influence the communication process (Individual)
6. apply your theoretical knowledge and communication skills in order to meet the communication needs of individuals within a health care context (Individual)

In addition, assessment item 1 required students to make explicit connections between course content and experience through individual and group activities and online discussion. The assessment related to the learning activities undertaken by students between week 3 and week 11 of the course. Student contributions were evaluated weekly by the course co-ordinator. Subsequent assessments promoted critical reflection through exploration and discussion of a critical incident (individual submission) and a critical reflection submission (individual).

As participation was an assessable component of the course, there was a clear relationship between participation as a category, and the actions and interactions between learners and between learners and teachers. Award of the greatest proportion of marks was dependent upon the content and depth of group discussion, determined by the learners' abilities to analyse, synthesise and/or apply communication theory to real world situations. Students were advised that participation in weekly online discussions was compulsory, the assessment criteria emphasised that learners who did not participate in individual or group activities would receive no marks and that failure to participate on three or more occasions; that is three out of 12 weeks of the course could result in the award of a fail grade for the assessment item, which could subsequently result in the award of a fail grade for the course. Although there was, clearly, an incentive for learners to participate in weekly activities, the nature and extent of the learners' participation was self-determined; the criteria did not specify the frequency or length of learner contributions. Participation, as a category, was therefore only partially determined by the course design, it exceeded the contextual conditions of the course and, as a result, it was recognised as an intervening condition.

Learner analytics

Because Case 5 was delivered using the Blackboard™ LMS, institutional averages used in comparison with Case 5 are derived from other courses offered in the same term by the same institution using the same LMS—Blackboard™. One of the first notable patterns discovered within the activity data is illustrated in Figure 4.25.

Comparison Blackboard™ Average against Case 5

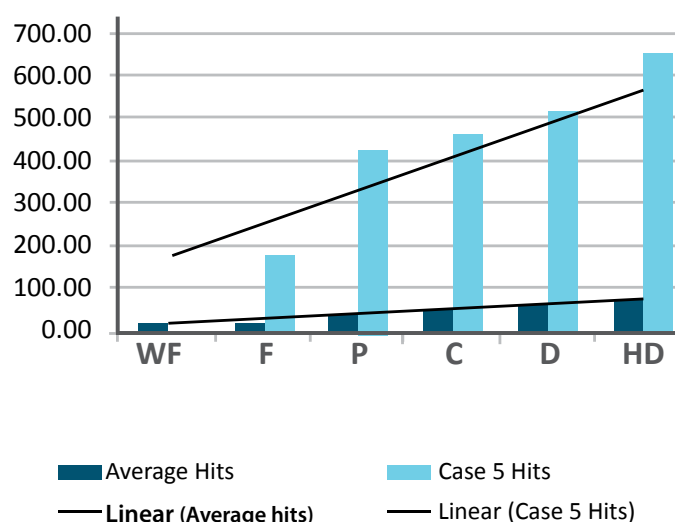


Figure 4.25: Average hits against grade for Case 5

Figure 4.25 shows the average number of hits for each student in Case 5 vastly exceeds the average for all other Blackboard™ courses. The Blackboard™ average was calculated from 372 courses from term 1, 2006, with a total of 64,748 student course combinations. While there are many contributing reasons for the variation between this course and the Blackboard™ average, this course was specifically designed to anchor student interactions within the LMS course site by the course designer. Of further note is the Case 5 linear trend line showing an incline along the grade groups which is consistent with that of the institutional average. This fits the behavioural pattern of higher hits resulting in higher grades for students.

Figure 4.25 is an indicator of the level of student participation within the course site but does not describe how student activity was divided amongst the three interaction types that Anderson (2008) describes. Online interactions are unusually complex owing to the nature of the online environment which is computer-mediated and tends to be heavily text-based and time-dependent (Gunawardena et al., 2001). A criticism of LMS has been that they are based on an overly simplistic understanding of the relationship between teachers, student learning and knowledge (Coates et al., 2005). This is particularly true in the context of Case 5 in that it predated the more sophisticated communications tools that are available in today's LMS. The Blackboard™ LMS that hosted Case 5 was a legacy version dating back to 2004 and predominately used text-based discussion forums to facilitate class discussion and discourse. Table 4.17 shows the proportion of student hits within these discussion forums compared with overall hits for Case 5 and all other Blackboard™ courses of the same term. This provides insight into the design philosophy of the course designer and highlights how the design philosophy differs from the norm.

	Non-forum clicks (hits - dhits)	Forum clicks (dhits)
Case 5	66%	34%
Overall	83%	17%

Table 4.17: Proportion of clicks within discussion forum areas

Table 4.17 shows the proportion of discussion forum hits (dhits) against overall hits. When viewed in conjunction with Anderson's (2008) model of interactions, the overall hits in the above table could be seen as an indicator of learner-content interaction while clicks within the discussion forums could be seen as an indicator encapsulating learner-learner and learner-teacher interactions. Table 4.17 shows that 52 per cent of the clicks for Case 5 were made within the discussion forums, which contrasts with 17 per cent for the 372 courses that were hosted on Blackboard™ in term 1, 2006. This would suggest that the design philosophy behind Case 5 was aimed at facilitating discussion between staff and students when compared with other Blackboard™ courses in the same term. It is important to note that the dhits shown in Table 4.17 are representative of clicks within the discussion forum area and encompasses forum navigation clicks and forum reads as well as forum posts and replies.

The forum clicks shown in Table 4.17 are indicative of the cumulative total of learner-learner and learner-teacher interactions. Table 4.18 focuses on the quantity of dhits in the forums, along with the number of posts and replies, compared to the overall Blackboard™ average for term 1, 2006.

	Dhits	Posts	Replies
Case 5	29245	1093	1354
Blackboard™ average	8525	133	319

Table 4.18: The quantity of dhits, posts and replies for all students in Case 5

The average quantity of dhits for Case 5 was three times higher than the Blackboard™ average of the same term, correlating with the high hit counts evident in Figure 4.25. Likewise, the initial post and replies in Case 5 were eight and four times higher respectively. Clearly, workload in Case 5 was significantly higher than the average course for term 1, 2006. Remembering that posts are initial messages commencing a thread of discussion, and replies are messages responding to other post and replies, Table 4.19 shows the breakdown of these student discussion forum posts and replies according to which category of interaction they encompass. It details the number of learner-learner and learner-teacher interactions, along with the ratio of interaction between these two types compared to the overall Blackboard™ average for term 1, 2006.

	Learner-learner	Learner-teacher	Ratio of LT to LL
Case 5	1187	161	0.14
Blackboard™ average	247	71	0.29

Table 4.19: Learner-learner, learner teacher interaction in Case 5

Table 4.19 shows that learner-learner interactions are exceedingly prominent when compared to learner-teacher interactions. This, again, points towards a design philosophy that encourages interaction with particular attention to peer learning. While both the learner-learner and learner-teacher figures for this course vastly exceed the average for all other Blackboard™ courses, the ratio of learner-learner to learner-teacher interactions is particularly telling. This ratio suggests a disproportionately high number of learner-learner interaction. Figure 4.26 shows a breakdown of the three interaction types within Case 5.

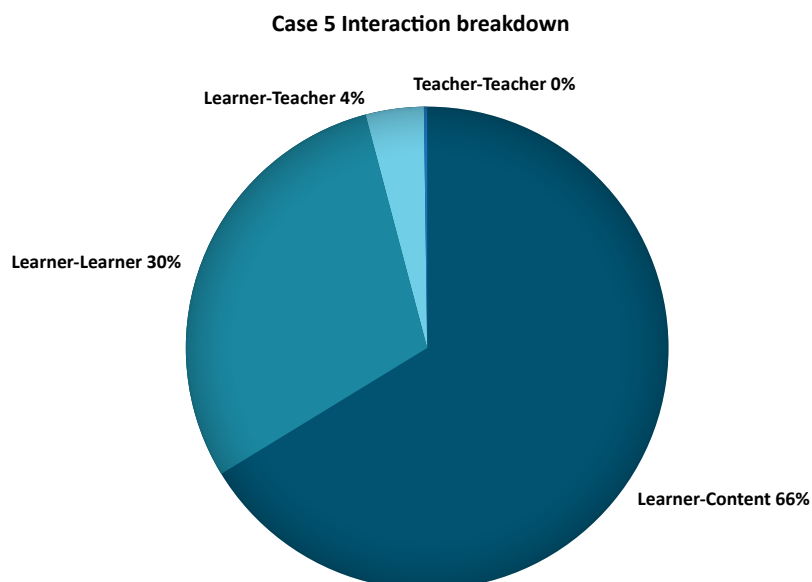


Figure 4.26: Interaction types within Case 5

Figure 4.26 shows that learner-learner (30%) and learner-content (66%) interactions dominate the overall proportion of interactions occurring within this course with learner-teacher interactions contributing only four per cent. Figure 4.27 demonstrates how this course differs from other Blackboard™ courses held during that term by showing the same breakdown of interactions.

Term 1, 2006 Blackboard™ interaction breakdown averages

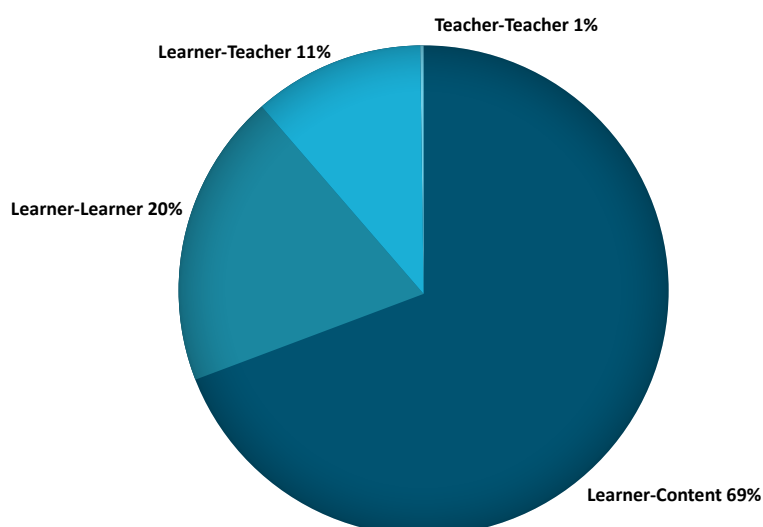


Figure 4.27: Term 1, 2006 Blackboard™ interaction breakdown averages

Figure 4.27 shows the interaction breakdown for all courses on Blackboard™ for term 1, 2006. Learner-content constitutes a majority of the interactions for courses on Blackboard™ during term 1, 2006, and this aligns with existing research into LMS feature adoption by staff. It has been shown that LMS features that promote content dissemination are the features that are adopted by teaching staff earlier and more often than more complex pedagogical features such as discussion forums and online quizzes (Malikowski et al., 2007). This would suggest that LMSs make it easier for teaching staff and course designers to employ features that allow student interaction with content over features that promote class discussion and discourse. Figures 4.26 and 4.27 appear to confirm this in that Case 5 was deliberately designed with a learner-learner focus, but still had a considerably high proportion of learner-content interactions (66%) not too dissimilar to the average across the entire term (69%).

Qualitative analysis

Learner-Learner interaction

Learner-learner interaction, within this study, was identified as a social activity, one which involved two-way communication between two or more students within the learning context, with the purpose of completing an instructional task or contributing towards the development of social relationships.

Appendix A provides a detailed overview of the conditions, intervening conditions, actions/interactions and consequences of learner-learner interaction within this course.

Processes: Communication strategies and relationship development Communication strategies

Constant comparative analysis of learner contributions revealed a range of self-initiated strategies which included: the adaptation of text to convey non-verbal communication, specifically the use of bold text, capitalisation and/or emoticons; the use of photographs as a means of introduction or to provide an image of themselves in an otherwise textual environment; and the use of brackets to contextualise content within a post and the use of humour, which was frequently used to limit or reduce the potential negative impact of a particular comment. These strategies appeared to have been initiated in order to overcome the difficulties the learners experienced within the non-visual setting.

What I find interesting about the online group is the ability for emotion to still come across even though we cannot see the nonverbal language. We also have a couple funny characters in our group who help to alleviate the seriousness of the tasks and amount of work involved. There have been a couple of incidences of miscommunication that have caused some poor feelings but through constructive discussion the poor feelings went and were replaced with connection and unity...

From a teaching perspective, the time that learners were expected to spend on their studies each week and expectations in relation to learning objectives, learning activities and learning outcomes were documented in the form of guidelines, assessments and assessment criteria within the course profile. The suggested study commitment for the course in this Case amounted to 12 hours per week, typical of an undergraduate course with a value of six credit points. The analysis of learner contributions revealed some disparity between institutional expectations and learner perceptions of the time necessary to meet the requirements of the course.

...An online learning group is a great way to learn, but I think there is a bit too much expected of us (that's uni for you though). If this was the only subject being studied it wouldn't be an issue, but for those that are doing 2, 3 or even 4 subjects it is a struggle...

Learners considered time to be of the essence and the analysis of transcripts from small group discussions revealed that in addition to the guidelines contained in the course profile learners developed a range of protocols that provided structure for interaction and collaboration within small group contexts. Separately, each group established clear procedures that required individuals to be prepared to collaborate and to fulfil certain roles and/or tasks within a given timeframe. In effect, learners created time constraints for themselves in order to complete small group activities and meet small group goals.

...The opportunity to interact as a group in our online learning environment has been a very valuable part of the study process. The group norms, established by our tutor and then further established within our small group of having clearly defined set tasks and deadlines to complete these has been a factor in the groups efficiency

Relationship development

In this course, learners also acknowledged a connection with others; one that was derived less from the social structure of the course and more from the relationships that they developed with peers in their learning groups. As group members: they shared personal and group goals and devised strategies which enabled them to negate the challenges that they encountered within the online context; they were open with one another and disclosed information, which enabled others to acknowledge both shared and diverse experiences; they invested time and effort and worked together to achieve their learning objectives; and they offered and received emotional and material support, which reinforced their perception that although they were distant from one another they were not alone.

... Although I am a member of two groups for this online course I feel I have only experienced a bonding with my smaller group with which I conduct my group activities... In this small group we have worked together and communicated towards reaching a mutual goal ... The small size of the group has allowed our communication to flow beyond our task topic and include personal information that has highlighted our differences and similarities...

The affiliation among learners within this study was primarily based on enrolment in the online communication course and subsequent allocation to diverse learning groups. Relationships of all types are built, refined and transformed through interpersonal communication (Wood, 2004) and, as a result, they develop over time (DeVito, 2004). Although all exchanges between two or more persons are considered interpersonal (Adler & Rodman, 2003), not all relationships share the same interpersonal qualities; consequently, they may be perceived to exist on a continuum with impersonal at one end and highly personal at the other (DeVito, 2004). A working relationship has been defined as “an interpersonal relationship that is task-based, non-trivial and of continuing duration” (Gabarro, 1990, p. 81); thus by definition, one might expect the interactions between learners to be primarily task orientated but this was not the finding in this Case.

... it has been the immediate group members who have boosted my confidence and made me feel that I'm not a complete idiot. I love the acceptance and support shown, the positivity within the group is great.

Several models have been developed which illustrate a number of stages in the process of relationship development (DeVito, 2004; Knapp, 1984). These models have been devised based on interpersonal interactions and relationships formed in traditional, face-to-face contexts. Although it has been argued that traditional theories about relationship development may not be applicable in online settings (Cho, Trier, & Kim, 2005), existing tools when modified offer a means of visualising the process within online contexts. Figure 4.28 presents the adaptation of a six-stage model of relationship development. The model incorporates a series of stages associated with most relationships that include contact, involvement, intimacy, deterioration, repair and dissolution; each stage is conceived to have an early and a late phase (DeVito,

2004). The two phase concept has been retained within the adapted model, as have the arching and double-headed arrows which link each stage; these are intended to illustrate the cyclical nature of the process. The phases within the first three stages have, however, been modified to reflect the process of relationship development among peers within the online course. Although the diagram presents a somewhat linear view of the process, each stage and/or phase need not occur in sequence and, in this Case, not all learners experienced each stage and phase depicted.

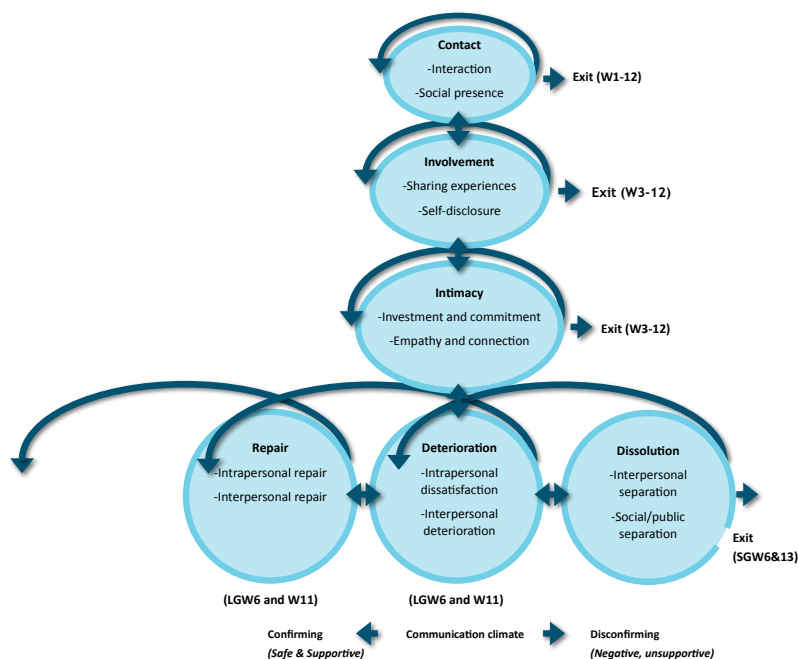


Figure 4.28: Stages of relationship development within Case 5 (adapted from DeVito, 2004, p. 237)

NB* W1-12 relates to weeks within the academic term, SG relates to small groups of students (n=3-5), LG relates to large group of students (n=21)

Current definitional themes (Rovai, 2002) suggest that a learning community may be described as a group of individuals who share a common purpose or goal, collaborate to address learning needs and draw from individual and shared experiences in order to construct knowledge and enhance the individual and collective potential of community members. Although it has been argued that physical separation reduces the individual's sense of community and gives rise to feelings of disconnection, today the concept is considered more relational than geographical (Brook & Oliver, 2003), which is a view supported by the outcomes of this study. This investigation determined that learners in this Case exhibited the characteristics of an online learning community and, although they did not articulate it as such, they were aware that their connections exceeded that of a learning group.

I know that we are classed as a group ladies but do you think that we are evolving into a team, due to the intimate knowledge we are collecting of each other, achieving more independence as our abilities grow and not needing as much tutor help, the ability for us to co-ordinate ourselves and resolve issues to achieve the end goal and work as a unit? If we were disbanded and made to reform to other groups we would not have the cohesion required to work as well as we do.

This comment is significant not only because it supports the notion that the relationship among learners, particularly in small groups, went beyond that of a task-orientated group, but also because they acknowledge the relational aspects of the bonds among group members, highlight the ability of the group to work together (without supervision) to achieve their aims and draw attention to learner perceptions that cohesion (and, therein, the learner's sense of community) may be adversely affected by changes to group membership. The latter view was supported by learners who separately discussed the negative impact that changes to group membership had within their small groups and others who revealed feeling like intruders when they joined a small group with long-term members.

...Initially, my group was small, and we found it easy to work together and establish rules and processes within our group. However, we have had group members leave, others added, some fail to contribute on occasion, and others leave again. Since then I think it has been difficult for our group to develop strong cohesion, and work to the same rules and processes that were set within the initial group. At week 8 of term, we are now beginning to work well together, and slowly establish and commit to new rules and processes, with only few minor hiccups...

The fact that learners did not perceive the same sense of community, unity, cohesion, support and belonging within the large group as they did in their small groups and that some learners in small groups took time to develop that sense of belonging is significant not least because it supports research which suggests that the experience within a community is context specific (Sonn, Bishop, & Drew, 1999).

Knowledge and understanding

We can learn about ourselves by a number of different means; for example, through introspection, reflection and interaction with others. In this Case, the increased awareness of learners can be attributed to a combination of all three because learners participated in collaborative learning activities and engaged in a process of knowledge construction that involved remembering internal and social negotiation and articulation. Introspection involves thinking about thoughts and feelings but it does not involve testing the validity of the experience; as a result, it is considered a thoughtful, rather than a reflective, action (Mezirow, 1991). Yet, self-knowledge can occur as the result of thoughtful action as well as from content, process or premise reflection. We, also, have an opportunity to increase our self-awareness through our interactions with others, learning how others see us and by reflecting on their perceptions (Wood, 2004). However, others are likely to offer their opinions only if they consider it safe to do so (Wood, 2004). Learners within this course engaged with course concepts and formed close relationships with peers. The relationships that developed provided learners with opportunities to learn about themselves and provided a mechanism for them to provide others with a reflection of themselves.

After reading your submission I think I am a very inconsiderate listener. I mindfully listen for a while but I find if the conversation bears little relevance to me and mine, or there is little learning content I tend to drift. I had not realised how hurt other people become and for this I am sorry. I guess it is like most things until we learn a truth it has very little i[m]pact on us. I agree with [student] this course has certainly softened my views and made me more aware of other views/stances. Thanks for being so willing to share...Thank you to each of you that open and share your thoughts-they certainly make me review mine.

In this course, learner ability to be open and share experiences led to an increased awareness of self and others. This knowledge together with exposure to the diverse understandings of others resulted in learning that was for some students transformational. Transformational learning is recognised as an adult form of metacognitive reasoning (Mezirow, 2003) with individual and social dimensions. The previous example demonstrates the process, which involves learner participation in constructive discourse and use of the experience of others to validate, assess and advance arguments to support beliefs and implement decisions based on insights that may occur (Mezirow, 2000).

Learner–Content interaction

Learner-content interaction is considered a defining characteristic of education (Anderson, 2008; Moore, 1989), one which involves learner's interacting, intellectually with content in a way that leads to a change in their understanding (Moore, 1989). As the previous analysis demonstrates, learner engagement with course content in conjunction with learner-learner interaction led to an increase in awareness of self and others. Qualitatively, attention was paid to how learners engaged with course content and the ways course resources were used. Appendix A, Case 5 illustrates similarities with a detailed overview of the conditions, intervening conditions, actions/interactions and consequences of learner-content interaction within the course. As one might expect, the conditions and intervening conditions, previously discussed, remain constant.

Processes: Reflection, internal negotiation, articulation, social negotiation

The processes that occurred as actions and interactions in this unit of analysis relate to the construction and reconstruction of knowledge by learners within the course. The course design required learners to engage in collaborative learning activities, to draw upon personal and/or professional examples of interpersonal communication and to discuss and demonstrate understandings of the connections between communication theory and personal experience. Learning activities served as the initial trigger for reflection within the large and small groups and learners drew from a wide range of communication experiences, drawing examples from interactions with family, friends, colleagues, peers, acquaintances and others. Educationally, it is recognised that experience alone may not be sufficient for learning to take place and that structured reflection may facilitate the learning process (Ash & Clayton, 2004; Boud, Keogh, & Walker, 1985). While reflection was necessary within this course, learners did not receive structured guidelines. Rather, they were encouraged to reflect, to share their experience and

their understandings of theoretical connections with others and to document a rationale and/or support for their opinions and contributions, which were posted to large and small group discussion boards.

Knowledge construction and understanding are acknowledged to involve reflection and articulation by learners. As Jonassen et al. (1995) explain, “We debate, wrestle, and argue with ourselves over what is correct, and then we negotiate with each other over the correct meaning of ideas or events” (p. 12.). As a consequence, in addition to reflection and articulation, the process of learning involves internal and social negotiation. In this Case the notion of internal negotiation relates to the process the learner undertakes to identify an example that can be used to demonstrate, in some way, the communication principles being addressed within the course in a particular week; it also includes their selection of a personal experience which can be shared with others. Owing to the textual nature of the online learning context, learners are required to describe their experience and articulate their understanding by developing a written response and posting this as a contribution to the relevant discussion board. Meaning was subsequently negotiated through questions, disagreement, agreement, shared experiences, explanations and elaborations.

Our weekly group discussions are extremely valuable to broaden our ideas and understandings about a particular topic, as we ‘build on each other’s ideas, ... , and see new possibilities in each other’s comments

While some students demonstrated explicit links between theory and experience, by referencing course content to support personal points of view, others demonstrated implicit links through the use of bold text, inverted commas or by discussing concepts that had clearly been appropriated from weekly readings.

My friends tell me that I make them laugh, am dependable, responsible and that I am easy to talk to because I am non-judgemental. This is a form of reflected appraisal (Wood, 2004), they like these qualities about me and so I see myself with these positive attributes. These people are ‘uppers’ in my life. My children are also ‘uppers’ (My daughter is anyway, but my son is in a grunting phase) Sometimes I’m not the perfect parent and my kids let me know about it which is another form of reflected appraisal. I’m glad they know how to speak up for themselves when it is me who is wrong.

Consequences: Knowledge and understanding

In this Case, the separation of learner-learner from learner-content interaction was challenging due, primarily, to the design of the course, which required learners to incorporate course content within their contributions to discussions to support individual experiences or points of view. This approach led to the production of interactions (or artefacts) that, in themselves, could be regarded as course content, particularly when students were also required to constructively engage with the posts of their peers. Thus, the consequences identified in respect of learner-

content interactions reflect the individual and social nature of their participation in learning activities and the processes through which knowledge was constructed and reconstructed by learners. In this Case, learners reflected upon and documented their personal understandings ('my understanding'), explored and questioned the understandings of others ('your understanding'), shared experiences and negotiated joint understandings ('our understanding') and became aware of the diverse perspectives and learning behaviours of others.

Learner–Teacher interaction

Statistically, the ratio of learner-teacher interaction is relatively low compared to the ratio of learner-learner and learner-content interaction. From a constructivist perspective, learning is acknowledged as learner-centred. The degree to which this process is learner-centred is evidenced in part by locating the learner at the forefront of learner-teacher interactions. This approach is further evidenced by the higher incidence of responses to learner requests for guidance and support and the fewer number of initial posts to large and small group discussion boards.

Processes: Learner– teacher interaction, teacher-learner interaction, learning and instruction

Anderson (2008) draws attention to the range of formats that enable educators to adopt a less dominant role in the learning process within online contexts. In this Case, the fairly even distribution of learner-learner and learner-content interaction compared to the low level of learner-teacher interaction lends support for this view. Despite the low incidence of learner-teacher interaction in this course, it was deemed important to differentiate between learner-teacher and teacher-learner interaction. This was primarily due to recognition of the role that teachers play prior to the start of term in developing each course, learning activities and assessment items. The nature of the course design is recognised to influence how and the frequency with which learners subsequently interact with teachers during implementation of an online course.

Appendix A, Case 5 provides a detailed overview of the conditions, intervening conditions, actions/interactions and consequences of learner-teacher interaction within this course.

Actions and interactions were categorised as learner-teacher, teacher-learner and learning and instruction. In this analysis, the subcategories, within the actions and interactions, have been stratified to reflect the incidence of different types of interactions. For example, in this course, under the category teacher-learner interaction, offers of praise and encouragement were observed more often than offers of support or invitations for questions. Similarly, within the learning and instruction category, there was a higher incidence of feedback in respect of contributions to group discussions and assessment than there were explanations or links to different concepts.

While it was unsurprising to find that the majority of learner-teacher interactions consisted of requests for information, guidance and or support, there is some significance in the finding that teacher-learner interactions demonstrated both affective and instructional characteristics. While the incidence of posts demonstrating evidence of instruction was greater than the number that exhibited affective characteristics the frequency and nature of affective posts by the teacher in this course was significant. It is also important to note that the diverse range of teaching and learning strategies was utilised in addition to the learning activities embedded within the course.

Consequences: Conditions conducive to learner interaction

In this course, the affective nature of teacher-learner interactions was conceived to set the tone and create a climate that was conducive to learner interaction and the construction and reconstruction of knowledge. In addition to the provision of feedback, explanations and linking of concepts and questioning that occurred, the course coordinator was seen to promote further interaction and discussion within discussion boards, model the experiences of learners and promote reflection and critical thinking. The consequences of learner-teacher interactions in this course support the findings of previous research, which suggest that the role played by the teacher is an important one.

Knowledge and understanding

In this course, learners were encouraged to make full use of the synchronous and asynchronous communication tools made available within the online course. The ability to observe how learners interacted with each other and what resources they used to justify perceptions and opinions made it possible to offer learners specific advice and timely feedback in terms of their contributions. It also made it possible to view both the process and the outcomes of learner-learner and learner-content interaction. Consequently, in this Case, learners were encouraged and observed to reflect on personal experience, select an example from knowledge or experience (internal negotiation), share experiences and articulate their understanding of the link between theory and practice and discuss and debate individual perspectives (social negotiation). The development of personal relationships among learners, in small groups, resulted in open exchanges and the sharing of personal experiences which subsequently led to an increased awareness and appreciation of self and others.

Summary of quantitative analysis - Case 5

- The quantity of overall student clicks within this course vastly exceeds the institutional average for this LMS.
- The quantity of student clicks that occur within the confines of course discussion forums vastly exceeds the institutional average for this LMS in proportion and quantity.
- The ratio of learner-learner interactions occurring within this course vastly exceeds the term average for this LMS.

- On average, the majority of interactions occurring within Blackboard™ courses for term 1, 2006 are learner-content interactions.

Summary of qualitative analysis—Case 5

Table 4.20 summarises key elements associated with this Case. In this course, the course design (conditions and intervening conditions) promoted both learner-learner interaction and learner-content interaction in equal measure because, in order to achieve a successful outcome in respect of assessment 1 (between weeks 3-12), students were required to engage in both. These conditions also had a positive impact on the ways and the extent to which learners participated and engaged in learner-learner and learner-content interaction. Although learner-teacher interaction was, by design, significantly understated compared to learner-learner and learner-content interaction, the role of the educator was found to be important in setting the tone and creating an environment that was conducive to learner interaction and knowledge construction. The development of relationships among peers was important as it was these relationships which gave rise to a sense of community among group members and contributed towards a learning process which resulted in personal and collective transformations among learners.

Case 5		Units of analysis	Processes	Consequences
Conditions Textual communication Large and small groups Intervening conditions Course design Participation assessed	Learner–learner	Learner–learner	Communication strategies	Relationships among peers Sense of community (especially in small groups) Knowledge and understanding Awareness of self & others
			Relationship development	
Conditions Intervening conditions	Learner–teacher	Learner–teacher	Learner–teacher interaction Seek information guidance and support Teacher–learner interaction Offers praise or encouragement Invites self determination/ questions Acknowledges feelings and concerns Provides support Invites questions Ground rules Presents presence and sense of self Learning and instruction Feedback (contribution/assessment) Explains or links concepts Questions or probes Promotes interaction, discussion or debate Modelling via peers/others Promotes reflection/critical thinking	Creates conditions conducive to learner interaction and knowledge construction Knowledge and understanding Reflection Internal negotiation Articulation Social negotiation Awareness (self and others)
			Knowledge construction and reconstruction Reflection Internal negotiation Articulation Social negotiation	Knowledge and understanding My understanding Your understanding Our understanding Awareness (self and others)
Conditions Intervening conditions	Learner–content	Learner–content		

Table 4.20: Key elements of Case 5

Chapter 5 Cross case analyses

Introduction

This chapter presents cross case analyses of the multidisciplinary, undergraduate and postgraduate courses, which constituted the five cases presented in the previous chapter. These analyses are presented in two parts. The first part illustrates the type of cross case findings that can be achieved through learning analytics alone. The second part illustrates the nature of insights that can be gleaned from combining learning analytics findings with those of the qualitative thematic analysis of LMS data. The chapter concludes with the presentation of a model that explains the relationship among course design, interactions and learning in the online contexts of the five cases.

5.1 Learning analytics cross-case analysis

This section presents a cross case and cross-institutional analysis of the multidisciplinary, undergraduate and postgraduate courses that formed the basis of this research study using only learning analytics. A summary of the information presented in Chapter 5 is utilised to illustrate similarities and differences between levels of study (undergraduate and postgraduate) and educational institutions. The chapter concludes with the presentation of a model that explains the relationship among course design, interactions and learning in online contexts.

5.1.2 Variance between LMSs

The analytics elements of this report are based on student usage patterns within each course as evidenced by the data signature they leave behind. While both institutions used the Moodle™ LMS for the first four cases and the navigation variation between the institutions was minimal, Case 5 was based on a completely different LMS and this influenced the patterns of student behaviour owing to the different navigation paradigm for the Blackboard™ LMS. This section begins by analysing the difference between LMS in terms of the pattern of usage for staff and students.

Figure 5.1 shows the average hits for 102,065 Institution A distance student courses on Blackboard™ compared with 45,041 distance student courses on Moodle™ where students received a grade. Note that owing to gaps in student administration system data, grades for some students in some courses were not available and these student-course combinations have been disregarded.

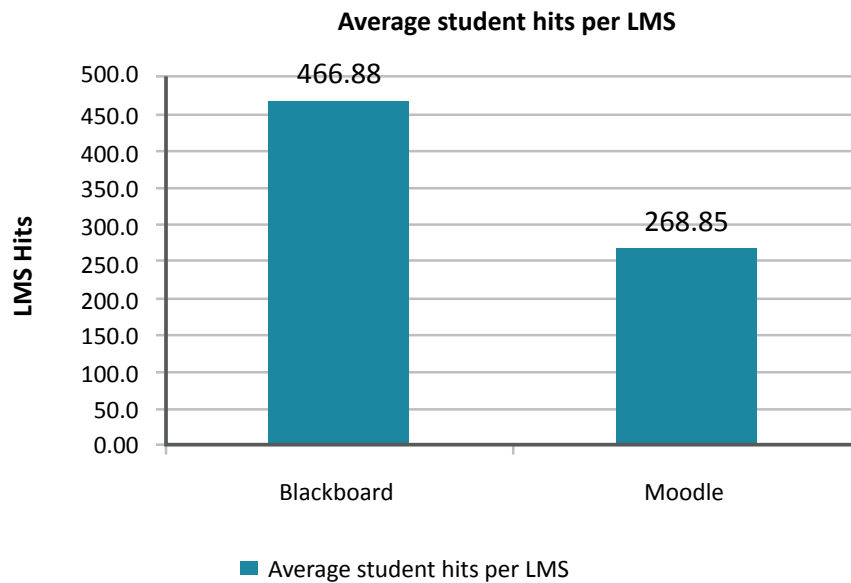


Figure 5.1: Average student hits comparison between LMS

Figure 5.1 shows that, on average, students using the Blackboard™ LMS had 58 per cent more hits than students on the Moodle™ LMS at Institution A. This highlights the different navigation strategies associated with each LMS that are identified in Chapter 3. In Moodle™, most of the course's resources and activities are available to students from the main course page and this reduces the number of clicks that students have to make within the Moodle™ LMS compared to the Blackboard™ LMS. Correspondingly, the analytics information derived from the backend databases for each system shows considerable difference between the two systems.

Figure 5.2 compares the average student clicks within each of the five case courses under analysis. This highlights the variation between LMS in terms of their navigation philosophies.

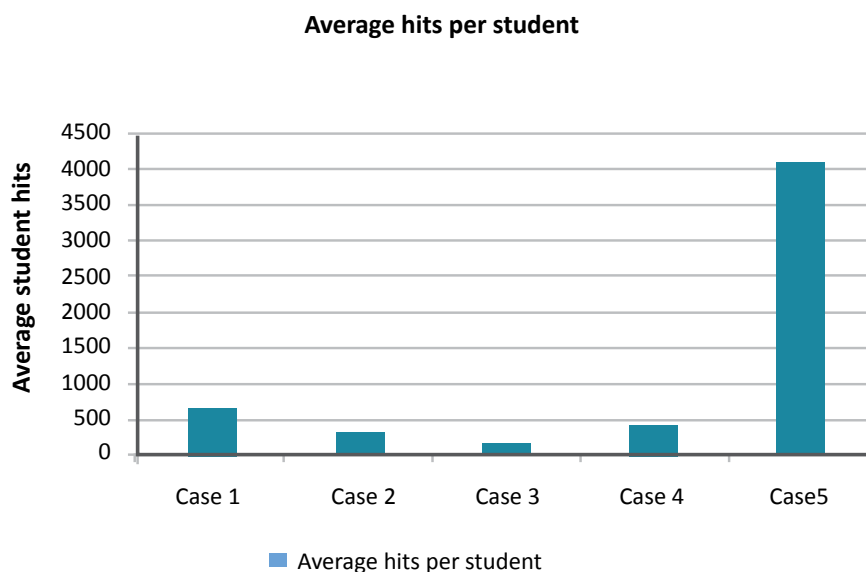


Figure 5.2: Average hits per student across the five cases

Figure 5.2 shows substantial variation between Case 5 and the other cases. Case 5 was delivered on the Blackboard™ LMS at Institution A and, while a proportion of this variation is attributable to the differing navigation philosophies, the variation vastly exceeds what would be expected. Considering that the Moodle™ average hits are 58 per cent lower than Blackboard™ average hits—as shown in Figure 5.2—reducing the Case 5 average student hits of 4075 by 58 per cent gives an average student hit rate of 2280, which is still three times higher than the next highest average student hits of 668 (Case 1). This points towards other factors contributing to the higher than average student hits for this course in excess of what would be expected through LMS variation.

Similarly, the teacher's experience with Blackboard™ and Moodle™ is different owing to the different navigation paradigm adopted by each LMS. The Figure 5.3 shows the average number of teacher hits on Blackboard™ compared to on Moodle™.

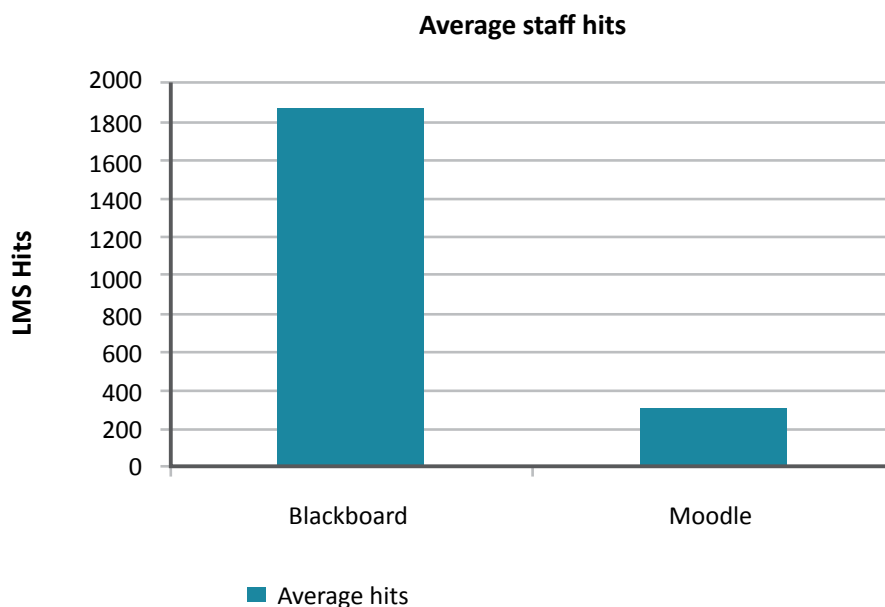


Figure 5.3: Average staff hits on each LMS

As Figure 5.3 demonstrates, teachers on the Blackboard™ LMS had, on average, 596 per cent more hits on the LMS compared with Moodle™. This was mainly due to vastly different interface design between the LMS, which required teachers on Blackboard™ to spend a great deal more time and effort in course development and delivery. While students on Blackboard™ averaged more hits than students on Moodle™, the same linear trend between student activity and their resulting grade was apparent for each grade group. Figure 5.4 shows the average number of clicks that students made within each grade group on Blackboard™.

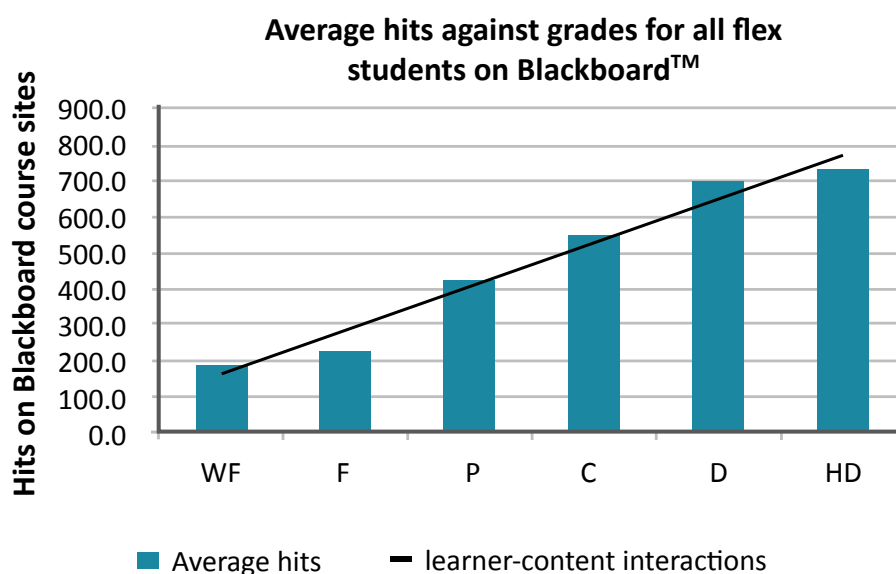


Figure 5.4: Average distance students' hits on Blackboard™ for each grade group

The following figure shows the average number of clicks that students made within each grade group on Moodle™.

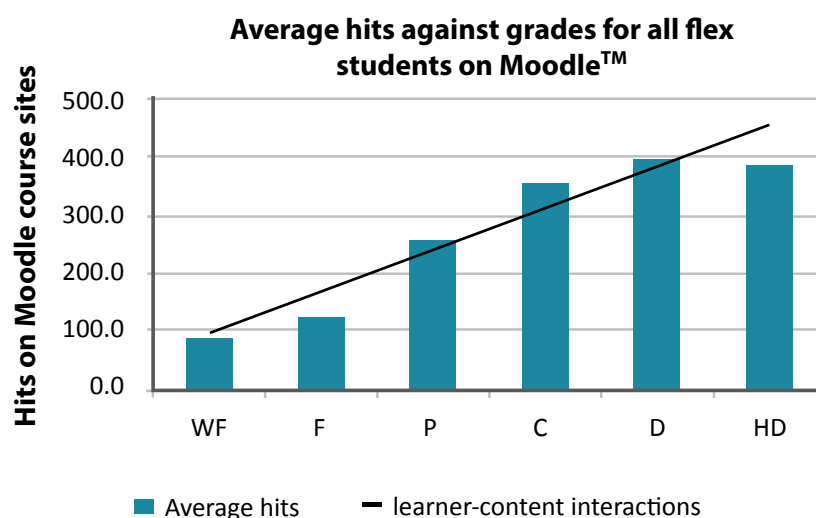


Figure 5.5: Average distance students hits on Moodle™ for each grade group

Figures 5.4 and 5.5 show a similar trend where average student hits on LMS course sites related to student grades. This was especially noteworthy when the population sizes for each of the above figures were considered: 102,065 students on Blackboard™ and 45,041 students on Moodle™. While averages hide the underlying complexity of and variations on student behaviours, the sheer size of the sample in conjunction with the similarity in trend between the LMSs pointed towards an underlying pattern of some consequence. That is, that hits on the LMS appeared to be a worthy indicator of student engagement and time-on-task. However, LMS hits alone did not indicate the nature of the interactions occurring within the LMS facilitated online courses.

As defined earlier, learner-content interactions are a summary of the hits students make outside of the course discussion forums. These figure include the navigation clicks that students make in and around content areas. For example, John Student clicks onto a folder that contains five documents that he needs to read for this week's preparation. While the five clicks he makes count as learner-content interactions, so too does the click he made on the folder. Owing to the way that each LMS stores its activity data, it is almost impossible to eliminate navigation clicks from the data sets and therefore they are included in the analysis of all three interaction types below. Furthermore, while John Student may have clicked on the five documents, it does not necessarily mean that John read them. Therefore, it is important to remember that the learner-content interaction calculations through learner analytics are only an approximation. This again alludes to the fact that analytics can show only patterns and trends and do not provide meanings or interpretation.

5.1.2 Learner-content interactions across cases

Most learning management systems are effective at facilitating learner-content interactions, with some research indicating that they may actually be better at this than face-to-face learning environments (Ladyshevsky, 2004). LMS provide the course designer with tools to sequence content and facilitate class discussions, although it has been said that LMS have impacted more upon administrative services than on fundamental learning and teaching (Organization for Economic Cooperation and Development, 2006). A previous figure shows a comparison among the five cases in terms of their average student hits. Figure 5.6 shows a comparison among the five cases in terms of the proportion of student hits that were learner-content interactions.

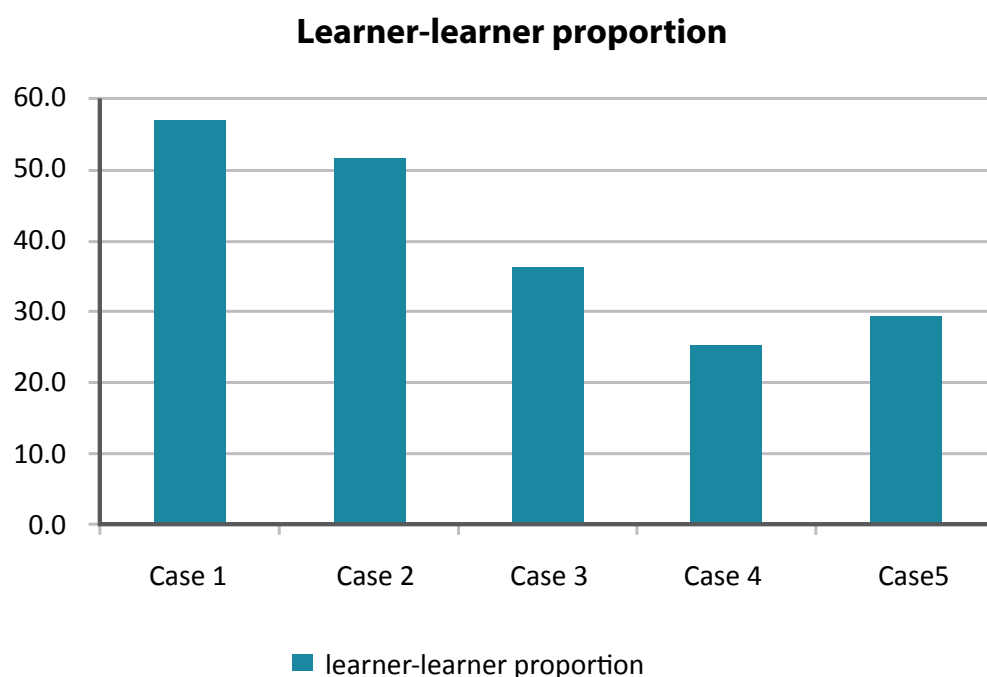


Figure 5.6: The proportion of learner-content interactions across the cases

Figure 5.6 demonstrates that Case 5 clearly has the highest proportion of learner-content interactions with 66 per cent and aligns with the evidence from Figure 5.4 highlighting the disproportionately high quantity of average student hits for this case. The analytics data for this case would suggest an extraordinarily high workload for the students in this course. This is explored further in the following section. Learner-content interactions were still dominant, and indeed, for all the other cases presented in this report. Case 3 was next with 54 per cent. However, if these cases are presented in terms of comparisons with other courses within their respective LMS, a different narrative appears. Figure 5.7 shows a comparison of these cases against institution-wide LMS learner-content interaction proportions.

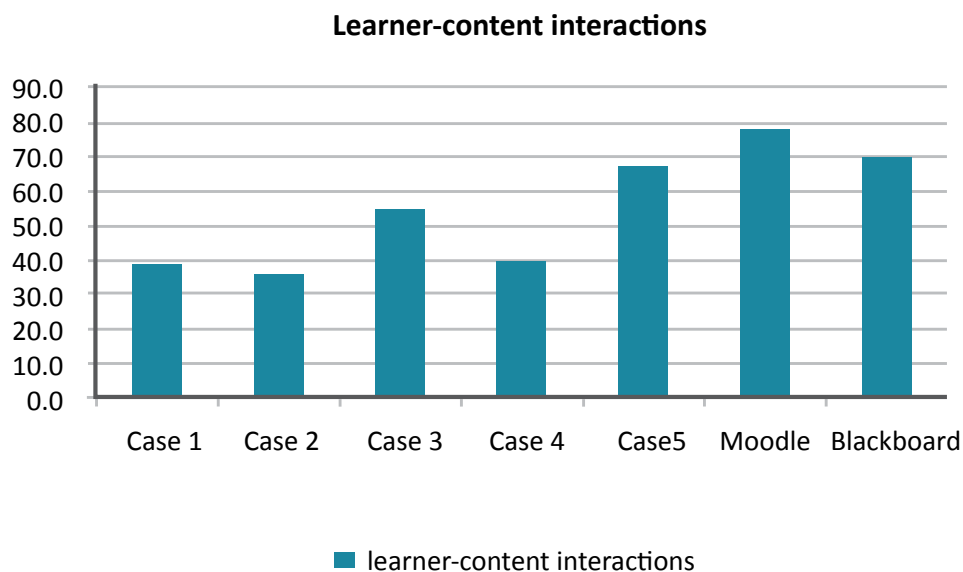


Figure 5.7: Comparison of learner-content interactions with institutional averages

Figure 5.7 suggests that, while Case 3 and Case 5 appeared to have higher quantities of learner-content interactions when compared with the other cases in this study, when compared with institution-wide LMS averages, they still fell below the average. The Institution A average for Moodle™ was 78 per cent, while that for Blackboard™ was slightly lower at 69 per cent. The lower levels of learner-content interactions for the five cases in this study would indicate that the course developers had different design philosophies compared with the average LMS course.

5.1.3 Learner–learner interactions across cases

While Garrison and Cleveland-Innes (2005) suggested that learner-content interactions are representative of cognitive presence, social presence requires that the learners interact with their teachers or peers. Further to this, Hay et al. (2004) found that learner-teacher interactions are a stronger predictor of learning effectiveness than learner-learner interactions. However, the Figure 5.8 shows that, in the five cases, learner-learner interactions comprise significant proportions of the interactions occurring within the cases.

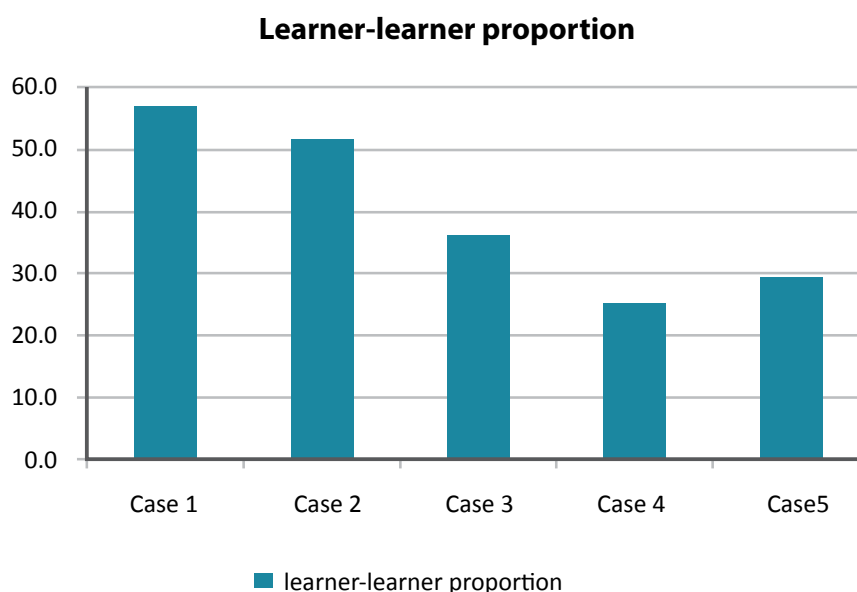


Figure 5.8: Learner-learner interactions across the five cases

Learner-learner interactions in Case 1 comprised 57 per cent of the interactions within this case, while Case 2 and Case 3 reported 52 per cent and 36 per cent respectively. Cases 4 and 5 had the lowest proportion of learner-learner interactions with Case 4 at 25 per cent and Case 5 at 29 per cent. Compared with the previous learner-content section, the learner-learner interactions across the cases were more distributed and quite dissimilar. This could be indicative of a link with research that suggests meaningful and educationally purposeful interactions amongst learners require teacher presence and effort (Wu & Hiltz, 2004).

Learner-learner interactions in Case 1 comprised 57 per cent of the interactions within this case while Case 2 and Case 5 reported 52 per cent and 46 per cent respectively. Cases 3 and 4 had the lowest proportion of learner-learner interactions with Case 3 at 36 per cent and Case 4 at 25 per cent. Compared with the previous learner-content section, the variation in learner-learner interactions across the cases is more pronounced. This could indicate a link with research that suggests meaningful and educationally purposeful interactions amongst learners requires teacher presence and effort (Wu & Hiltz, 2004).

More than 50 per cent of the interactions occurring within Cases 1 and 2 were learner-learner interactions. This could mean that the course design philosophy emphasised community among learners, or simply that the students were confused and resorted to asking one another questions in the absence of teacher interaction. Again, this points towards the limitations of analytics, as it does not provide the meaning or the value of the interactions. The problem of using only a single approach based on analytics was aptly described by Garrison and Cleveland-Innes (2005) when they said meaningful engagement does not simply correspond to sending lots of messages. More interestingly, while the proportion of learner-learner interactions for Case 5 is quite low compared to the other cases (second lowest only to Case 4), when compared with the count of interactions, a different story emerges as illustrated in Figure 5.9.

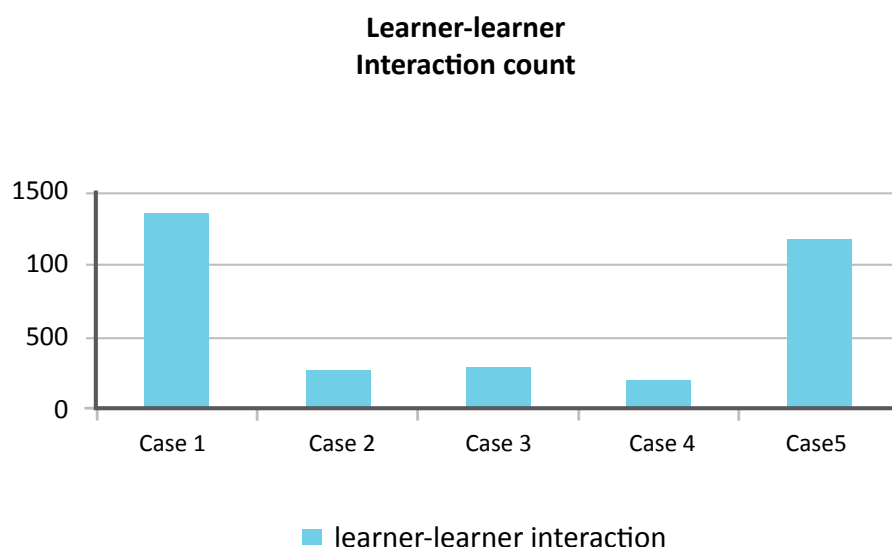


Figure 5.9: Learner-learner interaction count across all 5 cases

Case 5 has the second highest learner-learner interaction count of all the cases, second only to Case 1. This is particularly significant when taking into account the enrolment figures for each of the cases, as shown in Figure 5.10.

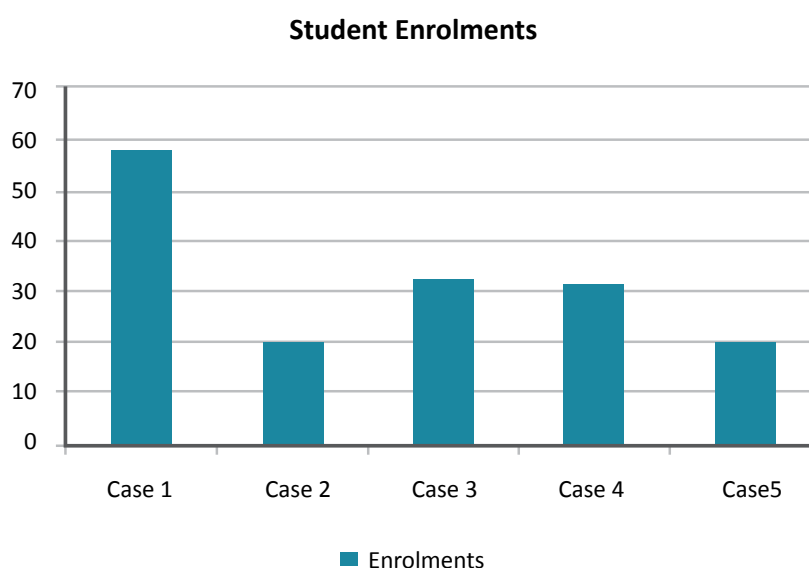


Figure 5.10: Student enrolments across all five cases

While Case 1 has a slightly higher learner-learner interaction count than Case 5, the latter has roughly a third of the students, 20 compared to 58 for Case 1 and equal smallest enrolment of all the cases. This number of learner-learner interactions, coupled with the learner-content interactions already discussed suggests a considerable workload for students in this case when compared to the others and to the institutional averages.

5.1.4 Learner–teacher interactions across cases

Teacher presence has been found to be the most significant factor for achieving meaningful online transactions (Garrison & Cleveland-Innes, 2005). As the significance of teacher presence

has been empirically verified for the development of meaningful interaction, it would seem reasonable to expect to see a relationship between learner-learner and learner-teacher interactions. Figure 5.11 shows the proportion of learner-teacher interactions for the five cases.

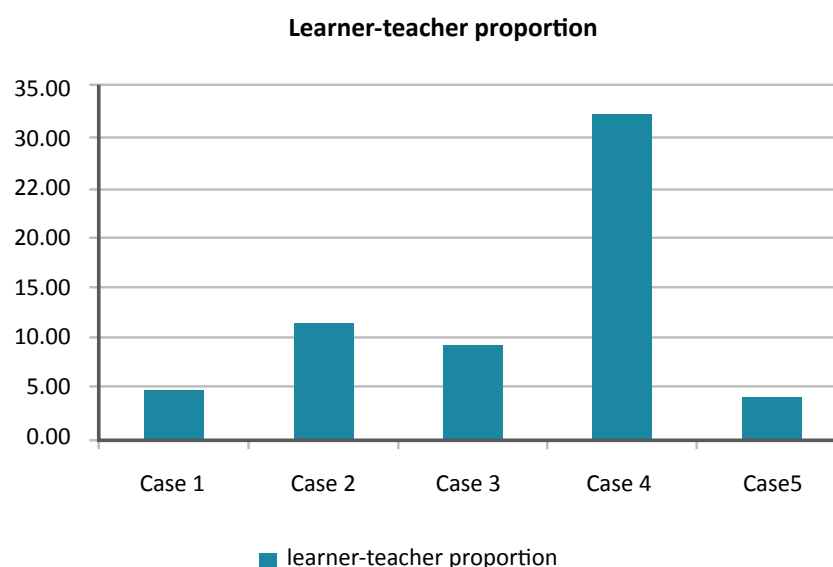


Figure 5.11: The proportion of learner-teacher interactions across the cases

Case 4 clearly had the highest proportion of learner-teacher interactions across the five cases with 32 per cent. The other four cases all fell below 12 per cent for their learner-teacher interactions; this pointed towards the centrality of the teacher to the course's pedagogy. Figure 5.11 shows the proportion of the course's interactions that were learner-teacher and fails to highlight what this means in absolute numbers. The learner-teacher interaction count could be a better indicator of the teacher's effort or social presence within a course—given that typically there is only one teacher. Figure 5.12 shows the same learner-teacher interactions for the cases except it reports the number of interactions.

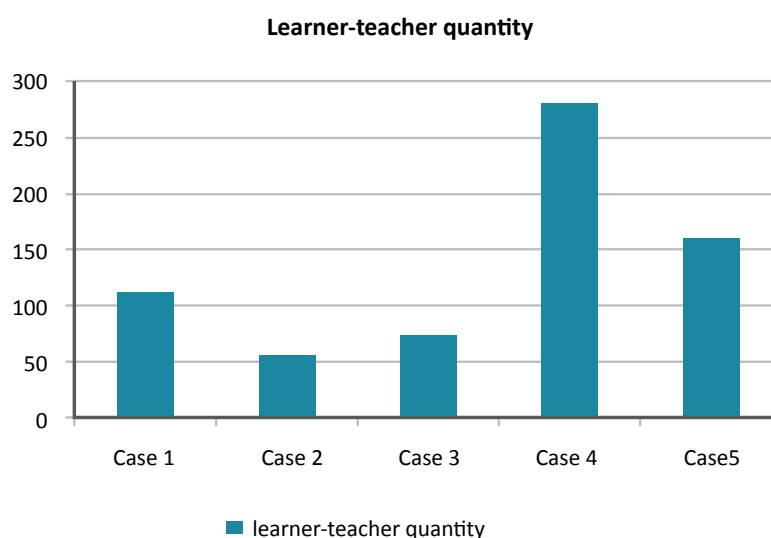


Figure 5.12: Learner-teacher interaction quantities across the cases

Figure 5.12 shows a comparison of learner-teacher interactions among teachers for each of the 5 cases. This is a good indicator of teacher presence as it shows the number of responses that each teacher makes to students within the course discussion forums for each case. Again Case 4 was notable with its significantly higher quantity of learner-teacher interaction, which may denote a course design and delivery philosophy that promoted teacher presence. This is especially notable when Case 4 is compared with the overall Blackboard™ and Moodle™ LMS averages of 11 per cent and 10 per cent respectively.

Figures 5.13 and 5.14 show the interaction breakdowns for Moodle™ and Blackboard™ overall, which gives a sense of how learning interactions were generally distributed across entire LMSs.

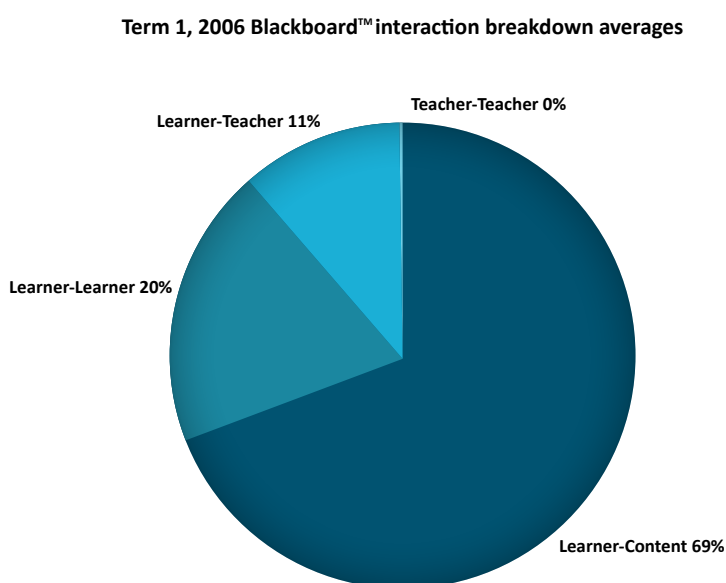


Figure 5.13: Breakdown of interactions across all courses in a single term (Blackboard™)

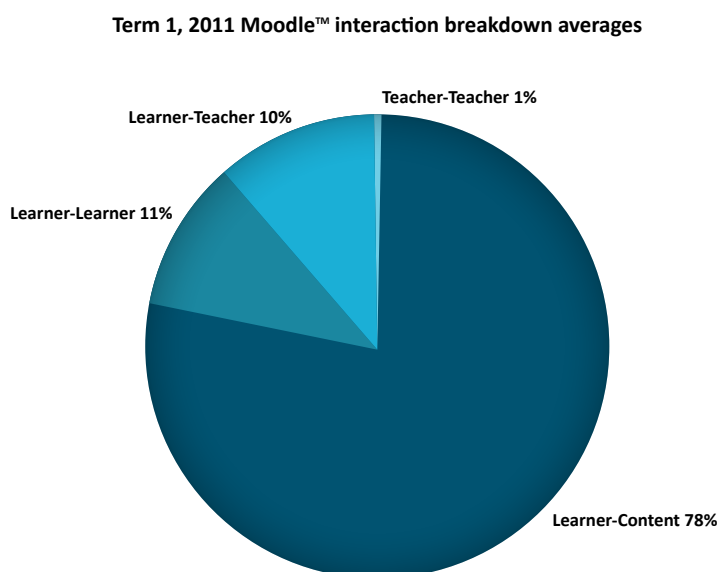


Figure 5.14: Breakdown of interactions across all courses in a single term (Moodle™)

Figures 5.13 and 5.14 show the dominance of learner-content interactions within each LMS. This would tend to align with the view that LMSs are not pedagogically neutral technologies and that, by their very design, they influence and guide teaching and its associated interactions (Coates, 2006). In this case, the dominance of learner-content interactions could be indicative of the ease with which LMSs allow the teacher to facilitate cognitive presence in the form of LMS features that facilitate learner-content interaction. Even the learning interactions of Moodle™, which is said to be based on social constructivist pedagogies (moodle.com, 2012), appear to favour learner-content interactions over learner-learner and learner-teacher interactions. This may not necessarily be the fault of the LMSs themselves, as the LMS is only a tool that is used by course designers and teachers. Teacher experience with the LMS, information technology departments and the administrative requirements of the institution are just some of the factors that will influence which, and to what level, LMS features are adopted and used. However, the data presented here suggested that the adoption of features that support the various learning interactions appeared to have been weighted in favour of features that facilitated learner-content interactions.

5.2 Thematic analysis of interactions across Cases 3, 4 and 5

Table 5.1 presents an overview of the outcomes of the qualitative analysis of Cases 3, 4 and 5 presented in Chapter 4. Information from this table is used in this section to demonstrate and discuss the research findings, which reveal similarities and differences between levels of study and discipline areas.

Units of analysis	Case 3 (PG)	Case 4 (UG)	Case 5 (UG)
	Conditions Textual communication Large group Intervening conditions Course design Participation assessed	Conditions Textual communication Large and small groups Intervening conditions Course design Participation assessed	Conditions Textual communication Large and small groups Intervening conditions Course design Participation assessed
Learner-Learner	Case 3 (PG)	Case 4 (UG)	Case 5 (UG)
Processes	Communication strategies Asynchronous Adaptations Humour Relationship development Contact Involvement Intimacy	Communication strategies Asynchronous/synchronous Adaptations Relationship development Contact Involvement Relationships with peers	Communication strategies Asynchronous/ Synchronous Adaptations (including humour) Small group protocols Relationship development Contact Intimacy
Consequences	Relationships among peers Sense of community (large group n=28) Acknowledge & value diversity Knowledge and understanding Work-related learning Creates conditions conducive to learner interaction and knowledge construction	Task orientated interactions/ working group Knowledge & understanding My understanding Our understanding	Involvement Conflict (among learners) Relationships among peers Sense of community (large (n=20) and small groups but especially in small groups n=3-5) Knowledge and understanding Awareness of self & others Transformation (personal and collective)
Learner Content	Case 3 (PG)	Case 4 (UG)	Case 5 (UG)
Processes	Knowledge construction & reconstruction Reflection Internal negotiation Articulation Social negotiation	Knowledge construction & reconstruction Reflection Internal negotiation Articulation Social negotiation	Knowledge construction and reconstruction Reflection Internal negotiation Articulation Social negotiation
Consequences	Knowledge and understanding (industry related) My understanding Your understanding	Knowledge and understanding My understanding Your understanding	Knowledge and understanding My understanding Your understanding Our understanding

Learner-Teacher	Case 3 (PG)	Case 4 (UG)	Case 5 (UG)
Processes	Learner-teacher interaction Seek information guidance and support Respond to/participate in learning activities Request further support Teacher-learner interaction Availability Presence and presentation of self Expectations and credentials Acknowledges feelings and concerns Learning and instruction Offers guidance re assessment Provides direction or access to course resources Rationale for content & approach Questions or probing	Learner-teacher interaction Seek information guidance and support Respond to learning activities Teacher-learner interaction Offers praise or encouragement Invites self determination Acknowledges feelings and concerns Provides support Learning and instruction Guidance re assessment Direction or access to resources Explains or links to different concepts Questions/probes	Learner-teacher interaction Seek information guidance and support Teacher-learner interaction Offers praise and encouragement Acknowledging feeling and concern Invites self-determination/questions Provides support Invites questions Ground rules Presents presence and sense of self Learning and instruction Feedback (contribution/assessment) Explains or links concepts Questions or probes Promotes interaction, discussion or debate Modelling via peers/others Promotes reflection/critical thinking
Consequences	Dissatisfaction with level of support Conflict (between learner/s-teacher/s) Knowledge and understanding (course design) Reflection Internal negotiation Articulation Social negotiation	Conditions conducive to learner interaction and knowledge construction Knowledge and understanding Reflection Articulation Social negotiation	Creates conditions conducive to learner interaction and knowledge construction Knowledge and understanding Reflection Internal negotiation Articulation Social negotiation Awareness (self and others)

Table 5.1: Cross-case learning interactions- qualitative analysis findings

5.2.1 Conditions and intervening conditions

Chapter 4 presented a description of five individual courses each of which constituted a case within this study. The conditions associated with each case were similar in that they required learners to communicate textually with one another in large and/or in small groups. Table 5.1 indicates that both undergraduate courses required a combination of large and small group

interactions, while the postgraduate course necessitated interaction only within a single large group. In each case, the large group constituted the student cohort for each course, while small groups were formed by 3-5 students who were also members of the larger student group. Assessment of interaction and completion of specific learning activities were common within each of the three courses; however, the weighting and nature of these activities varied within each course. Also divergent were the learning objectives associated with each course. The commentary in Chapter 4 drew attention to synergies and incongruities that were perceived to exist among learning objectives, learning activities and assessments within each course. In essence, each course design emphasised a particular approach to learning and assessment that was reflective of an individual and/or social process. Differences in course design and assessment strategy were found to have a significant impact upon the way learners interacted within each course.

Learner– learner interaction

As Table 5.1 shows, both undergraduate courses (Case 4 and Case 5), promoted the use of asynchronous and synchronous modes of communication. By contrast, learners in the postgraduate course (Case 3) utilised only asynchronous communication. Within the undergraduate courses, there was a crucial difference, related to the mode of communication, which had a negative impact on this study. In Case 4, learners were encouraged to use communication methods external to the LMS for small group work. This meant that not all learner-learner interactions could be observed or monitored during course delivery nor could they be analysed for the purposes of this study. By contrast, in Case 5 the coordinator promoted the use of communication methods available through the LMS for both large and small group work and the use of alternative methods was actively discouraged. Thus, a complete data set for case 5 was available to researchers for review. In Case 3, 4 and 5 learner-learner interaction was encouraged in each large group. An important driver, which promoted and encouraged learners to engage in learner-learner interaction in each of these three courses, was the assessment items that were associated with diverse levels of participation and other marking criteria.

Processes

In Case 3 and Case 5, students engaged in online conversations that involved two-way communication between two or more learners. In Case 3, these interactions occurred only in the large group, but in Case 5, learner-learner interactions of this type were observed in both large and small group discussions. By contrast, learners in the large group in Case 4 were found to engage, primarily, in one-way communication. This was exemplified by the submission of an individual post that contained no reference to, or discussion of the post of another learner. As students had a habit of posting their contribution as a reply, it is conceivable that the analytics statistics may have misrepresented these posts as learner-learner interaction. Similarly, the course coordinator posted the initial contribution to the discussion forum each week, to which learners replied. The nature of these interactions may have contributed to the misrepresentation of learner-content and/or learner-teacher interaction within the analytic analyses.

Learners in all three courses employed textual adaptations such as the use of bold text, capitalisation and emoticons to express non-verbal elements in their interactions. In addition, learners in Case 3 and Case 5 appeared to form relationships with peers in large and small groups through a process of contact, involvement and intimacy (refer to the relationship model and discussion presented in Chapter 4). It is interesting to note that learners in Cases 3 and 5 adopted a conversational style of communication and employed humour in their interactions with one another. By contrast, learners in Case 4 were inclined to post individual responses to learning activities within the large group. The posts observed among learners in the large and small groups tended to be task orientated. Contributions to small group discussion forums in Case 4 were found to be procedural, in as much as they primarily contained information about how and when learners would meet and who would complete what task in terms of assessment compilation and submission. Even so, it is apparent—from evidence derived from small group discussion boards—that learners were able to form relationships with peers in this course. This view is supported by the series of requests from learners that they remain with the members of their small groups for a subsequent assessment items. As in Case 5, in at least one instance, these relationships resulted in conflict and dissolution of the small group.

Consequences

The consequences of the communication strategies adopted by learners within each case lead to the development of relationships among peers. The nature of these relationships was more apparent in Case 3 and Case 5 owing to the visibility of learner-learner interactions. In both postgraduate and undergraduate courses (Case 3 and Case 5), learners demonstrated and/or expressed a connection with members of their learning groups that, in Case 5, was stronger within small groups. Learners in these two courses exhibited the characteristics of a learning community and expressed appreciation for the diversity of knowledge and experience within the large groups. By contrast, the viewable posts of learners in Case 4 exhibited the characteristics of a task orientated, working group.

Significance/importance

Significant issues in the analyses of learner-learner interaction relate to the absence of data in small group interactions by learners in Case 4. The absence of this and other information, such as attachments to posts, restricted the analysis of learner-learner interaction within this case. In Case 5, sustained interaction between learners was a course requirement between Week 3 and Week 12 of the academic term. By contrast, in Case 3, learners were required only to post an introduction, an initial post and three replies within the discussion forum up until Week 6. It is apparent from the analyses of Case 3 and Case 5 that learners who engaged in learner-learner interaction over a sustained period of time (7-9 weeks) formed bonds with others in their learning groups. The process of relationship development in these cases was also found to be similar. In Case 4 and Case 5, the relationship among the members of one small group deteriorated to the extent that it led to conflict subsequently leading to the dissolution of that particular group.

It is apparent that learners who engage in learner-learner interaction, in both undergraduate and postgraduate courses, can develop relationships with peers that engender a sense of community within a 12-week academic term.

In Case 3, it was the relationship among learners that creates the conditions conducive to interaction and knowledge construction. This aspect of Case 3 is discussed further in the cross case examination of learner-teacher interaction.

Learner–content interaction

In each course within this study, there was an educational requirement that learners interact in some way with course content. Learner-content interaction has been acknowledged to involve learners interacting intellectually with content in a way that leads to a change in their understanding (Moore, 1989). In Cases 3, 4 and 5, learner-content interaction constituted an assessable component of each course. Although the nature and weighting of assessment items across courses were diverse, each co-ordinator developed a range of learning activities that were intended to facilitate and promote learner-content interaction. Table 5.1 identifies the processes derived from the qualitative analyses of electronic transcripts from each course. In each case, these processes were found to contribute towards the construction and reconstruction of knowledge.

Processes

Chapter 4 provides an overview of the learning activities associated with each course. In Case 3, course resources and learning activities were related to human factors, specifically the discipline of ergonomics within industry contexts. In Case 4, they related to public relations and the media, specifically the roles and responsibilities of journalists, while in Case 5, course content related to the theory and practice of communication, specifically within health care contexts. It is interesting to note that although each course was associated with a different discipline, in each case, the associated knowledge and skill related to how individuals in particular fields of practice communicated to enhance meaning and or understandings of others.

In each course (Cases 3, 4 and 5), learning activities served as the initial trigger for reflection within large and small groups. In Case 3 and Case 5, learners were required to draw from personal and/or professional experience and to discuss understandings of these experiences with others. In Case 4, the approach was slightly different as learners were asked to reflect on readings or topical issues from a projected discipline point of view. In drawing from experience, learners in Case 3 and Case 5 were required to identify appropriate examples which were, generally, representative of a given concept or topic. The example selected also had to be one that learners would be comfortable sharing with others (internal negotiation). By contrast, in Case 4, learners were required to contribute a personal opinion or point of view on a reading or a topic that may have had little personal significance. In all three cases, learners were required to articulate their understandings by posting written text to discussion boards. In Cases 3 and 5, assessment items required learners not only to post a personal topic and or example, but

also to discuss and debate the contributions of others (social negotiation). Although the social negotiation of meaning and understanding was not observed within group discussions in Case 4, this interaction was assumed to have occurred during 'offline' discussions among small group members. Such an assumption is not unwarranted given that small group discussions in Case 4 culminated in the submission of a collaborative group assessment.

Mezirow (1991) points out: "We may reflect on the content or description of a problem ..., the process or method of our problem solving, or the premise(s) upon which the problem is predicated" (p. 117). The latter involves being aware of why we perceive, think, feel or act as we do and the reasons for, and consequences of, our perceptions (Mezirow, 1991). Learner reflection in Case 3 and Case 5 were observed to undertake reflection on content, process and premise. Although some authors argue that reflection is an independent process (Klooster, 2001), there is recognition, within educational literature, that it need not be a solitary activity (Boud et al., 1985; Brandt, 2008).

Consequences

In Cases 3 and 5, the combination of reflection and dialogic process resulted in demonstrations of individual knowledge ('my understanding') negotiated knowledge ('your understanding') and joint knowledge ('our understanding'). Owing to the invisibility of the knowledge construction process within Case 4, only 'my understanding' and 'our understanding' could be seen to occur.

Significance/importance

The analyses of Cases 3, 4 and 5 indicates that activities that require students to reflect and comment upon content, enables students to demonstrate an individual level of understanding. Activities that require reflection upon content and the articulation of student understandings in conjunction with learner-learner interaction would appear to offer learners opportunities to achieve greater depths of understanding and, if visible, opportunities for teachers to observe and measure the extent and or depth of understandings. Combined with learner interaction the latter approach facilitates awareness of self and others via content, process and premise reflection.

Learner–teacher interaction

Learner-teacher interaction continues to be regarded as essential by some educators and desirable by many learners. This may be because learner-teacher interaction tends to emphasise the roles and responsibilities of the educator rather than those of the learner as they design or are given a curriculum. It is acknowledged that the nature and extent of the educator's feedback will be determined by the level of the learners and the personality and philosophy of the educator. The finding of this study would certainly lend support to these points of view.

Processes

Across all three cases, learners were observed requesting information, guidance and support. Similarly, the educators in these courses supplemented the embedded learning activities with a diverse range of learning and teaching strategies which included providing guidance and feedback in respect of assessments, access or direction to course resources and being explicit about the relationship between diverse concepts. In each case, the teacher also questioned or probed learners to think more critically about issues and topics. The coordinator in Case 5 also actively promoted interaction discussion and debate, modelled learner responses to demonstrate effective and poor responses to activities and encouraged critical thinking. Within the two undergraduate courses (Cases 4 and 5), teachers were consistently found to offer learners praise and encouragement, to acknowledge the feelings and concerns of learners and to invite a degree of self-determination. In each of these cases, the teacher also offered a wide range of technical, content and emotional support. While the teacher in the postgraduate course also acknowledged the feelings and concerns of learners, the general nature of the interactions in this Case were observed to be teacher- rather than learner-centred.

Consequences

Unlike learners in Cases 4 and 5, learners within the postgraduate course expressed dissatisfaction with the level of support they received from the course coordinator and the time that they were required to wait to receive a response to enquiries posted either to the discussion board or to the lecturer's email address. This dissatisfaction resulted in some animosity between the learners and the teacher within this course. As the only discernible difference in the interactions between learner-teacher in this course was the relative absence of affective communication, it is asserted that affective communication sets the tone and creates a climate conducive to interaction and learning in online courses.

Significance/importance

Affective communication would appear to be an important factor in learner interactions in online learning environments. Positive student-teacher relationships have been described as relationships that are “mutually respectful and supportive” (Pendergast & Bahr, 2006).

5.2.2 Synthesis: Modelling interactions of Cases 3, 4 and 5

Based on the results, a model of learner interactions has been constructed, which explains the relationship between course design learner interaction and learning in online contexts. Learner interactions are central to the model. The model is illustrated in Figure 5.15.

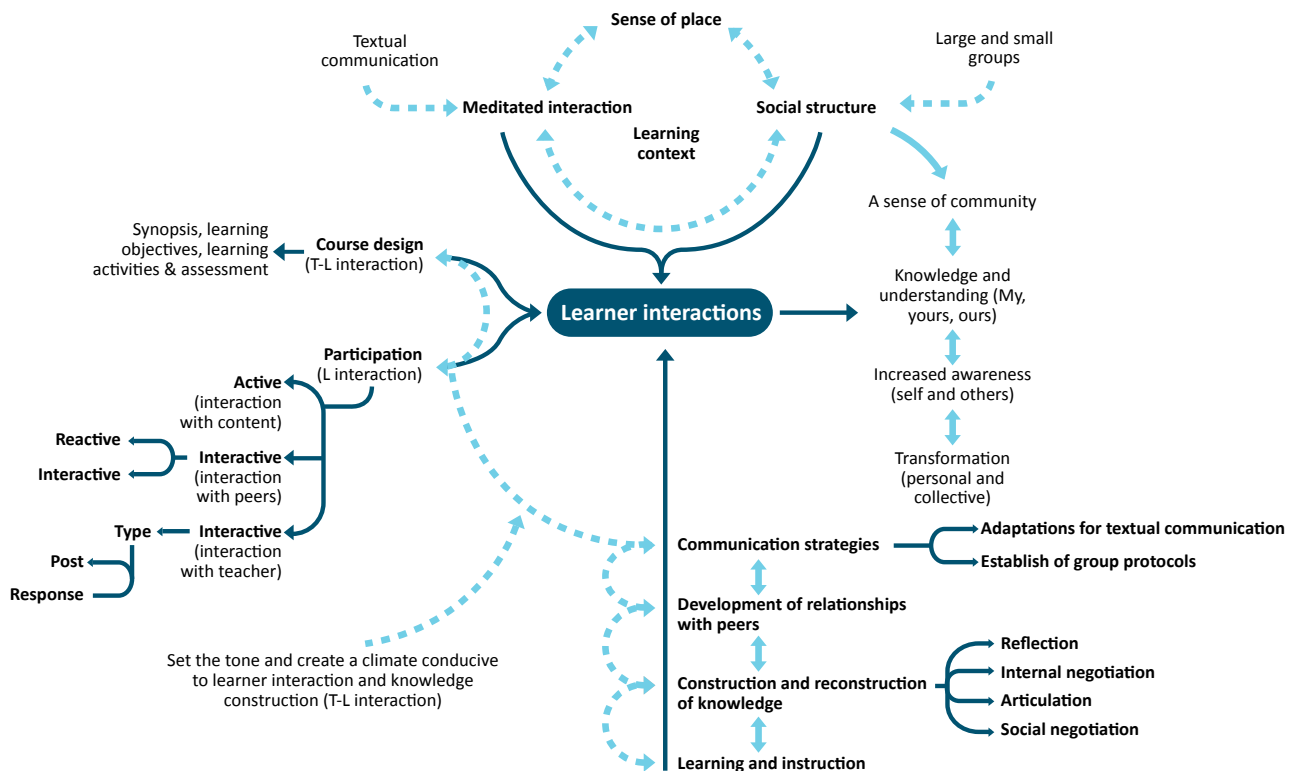


Figure 5.15: A Model of learner interactions in online contexts for Cases 3, 4 and 5

Textual communication and groups formed the basis of contextual conditions within each course as learners were required to communicate synchronously (Cases 4 and 5) and asynchronously (Cases 3, 4 and 5) in large (Cases 3, 4 and 5) and small groups (Cases 4 and 5) to complete learning activities during the 12-week term. Contextual conditions and learner perceptions of the learning context were found to shape the ways that learners participated in collaborative learning activities and constructed knowledge within each course. Although participation in collaborative activities tended to be characteristic of course designs (Cases 3, 4 and 5), the nature and extent of learner participation were, for the most part, self-determined. Consequently, course design and participation were categorised as intervening conditions within this study.

The size of the group was found to be an important factor with an impact upon participation in learning activities (Case 5). Learners were observed interacting with content and other learners to meet learning objectives (Cases 3, 4 and 5). During this process, learners initiated a range of communication strategies (Cases 3, 4 and 5) in order to overcome the social and educational challenges they associated with contextual conditions. These conditions (Cases 3, 4 and 5), in conjunction with student perceptions of the learning environment (Case 5) were found to be important in the development of relationships among learners within each course (Cases 3, 4 and 5). The learners' sense of place (Case 5), participation in learning activities and the communication strategies they devised (Cases 3, 4 and 5) promoted the development of open, supportive relationships with peers in large and small groups (Cases 3 and 5). Learners in Case 5 were inclined to associate intimacy and connection with members of their small groups and, although connections among members of small groups were considered stronger than those in the large group, the large group was perceived to offer diversity and access to a wide range of resources and support. Learners in Case 3 also formed supportive relationships with their peers

and expressed appreciation for the diverse range of knowledge and industry experience present within their large group. The processes of relationship development were found to differ from those formed in face-to-face contexts; an adapted relationship model, presented in Chapter 4, was used to illustrate the processes observed within this study.

Textual communication offered learners opportunities not available in traditional classrooms, including a forum for uninterrupted speech, a reduction in physical noise (Case 5) and time to reflect, prepare and review thoughts before engaging in discussions (Cases 3, 4 and 5). When this was combined with an environment that felt safe, if at times a little disorientating (Case 5), learners were able to construct knowledge by sharing, comparing and negotiating understandings using a conversational mode of learning (Cases 3 and 5) which incorporated reflection (Cases 3, 4 and 5), negotiation and the articulation of experience, knowledge and understanding (Cases 3 and 5). In each case (3, 4 and 5), the course coordinator was seen to utilise a diverse range of learning and teaching strategies to supplement activities that had been embedded within each course design. During the analyses of learner-teacher (teacher-learner) interactions, it became apparent that each coordinator fulfilled an important role, setting the tone and creating a climate that was conducive to learner interaction and knowledge construction within each course. For the most part, this role was achieved as a result of affective communication that provided praise and encouragement, opportunities for self-determination, the offer of support and acknowledgement of learner concerns.

Differences that were discerned in the types, degree and frequency of learner-learner, learner-content and learner-teacher interaction were found to have an impact upon the extent to which learners were able to demonstrate and/or achieve particular outcomes. In this study, the conditions, intervening conditions, actions and interactions within each case resulted in the achievement of a diverse range of learning outcomes. For example, learners in Case 3 and Case 5 were found to exhibit the characteristics of a learning community, while learners in Case 4 were likened more to a working or task orientated group (refer to Chapter 4). Learners in Case 4 demonstrated individual understanding and were assumed to have reached shared understandings, while learners in Case 3 and Case 5 were able to exemplify individual (my), negotiated (your) and shared (our) understandings of course concepts. In contrast, only a number of learners in Case 5 were found to reach levels of personal and collective transformation.

5.3 Summary

One important innovative approach taken by this project has been the conjoining of a relatively new field of research known as learning analytics with a more traditional qualitative, grounded theory analysis of staff and student activity within LMSs. As mentioned previously, analytics can be used to correlate patterns of behaviour with patterns within LMS activity data, but the meaning and significance of these patterns are almost impossible to interpret without detailed qualitative enquiry. The learning analytics shown Case 3, as the only case with more than 50 per cent of its interactions being learner-content interactions, is shown in Figure 5.16.

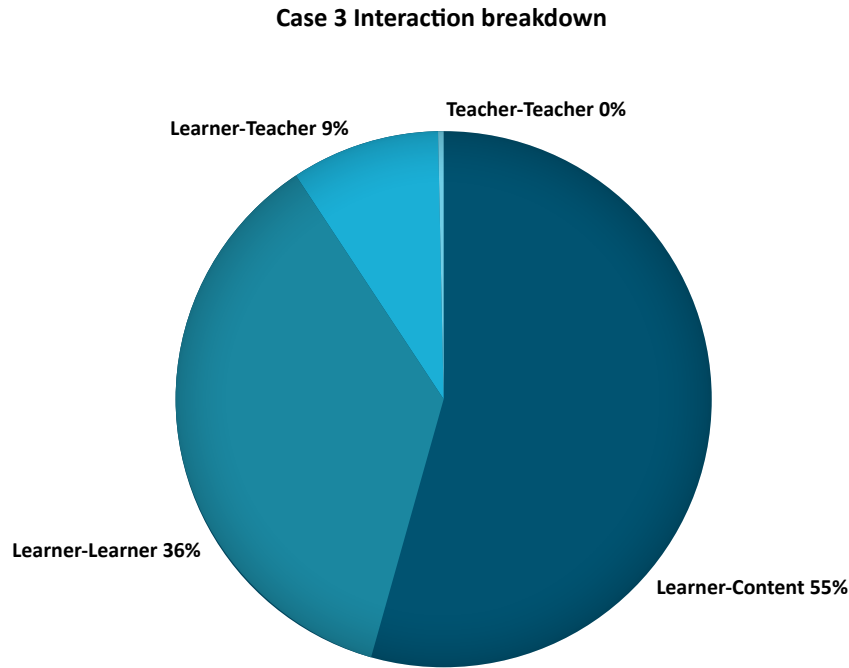


Figure 5.16: Case 3 interaction breakdown

Qualitatively, it was shown that Case 3 was a post-graduate course in which students were required to reflect on course content based on their own personal experiences. So, while the analytics showed a majority of the interactions were learner-content, they did not point to the reasons why this was so. The qualitative analysis suggested that the post-graduate students were more self-directed and, therefore, less dependent on interactions with the teacher and their peers than in the other cases. The analytics showed Case 4 as having an unusually high proportion of learner-teacher interactions but did not provide any clues to why this pattern occurred.

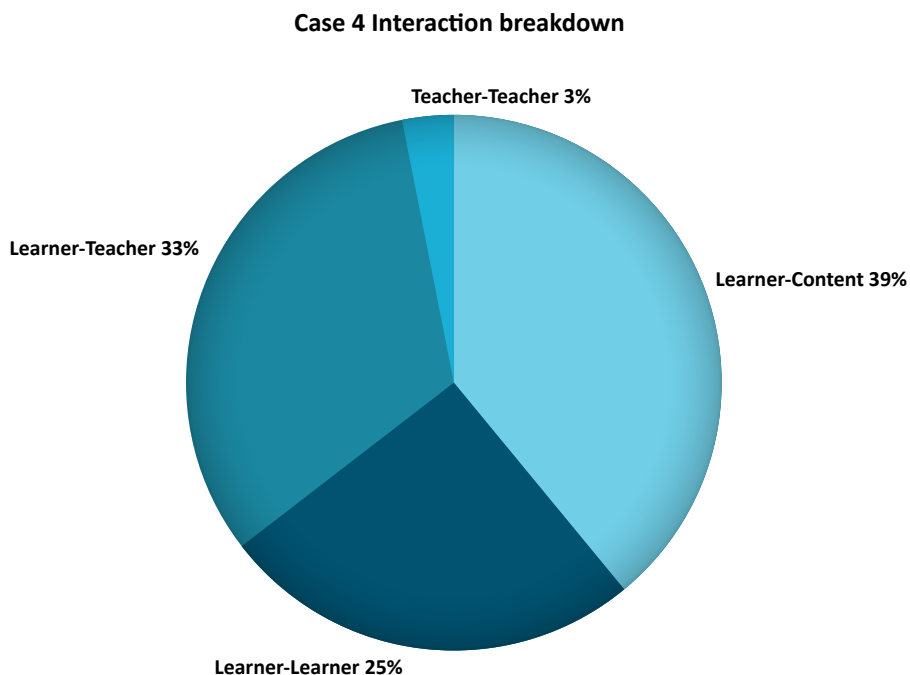


Figure 5.17: Case 4 interaction breakdown

The qualitative analysis on the other hand showed that the learner-teacher interactions were mainly concerned with student guidance and support within a large group. Supporting this observation, Case 4 had lower proportions of learner-learner interactions than the other cases owing to its higher proportion of learner-teacher interaction. So, while learner-teacher interactions were significantly higher than in the other cases and, indeed, the institutional averages, it was due to the students seeking guidance and support and not necessarily caused by the development of community. Case 5 was similar in some respects to Case 3 in that the assessment required students to debate and discuss topics with other students.

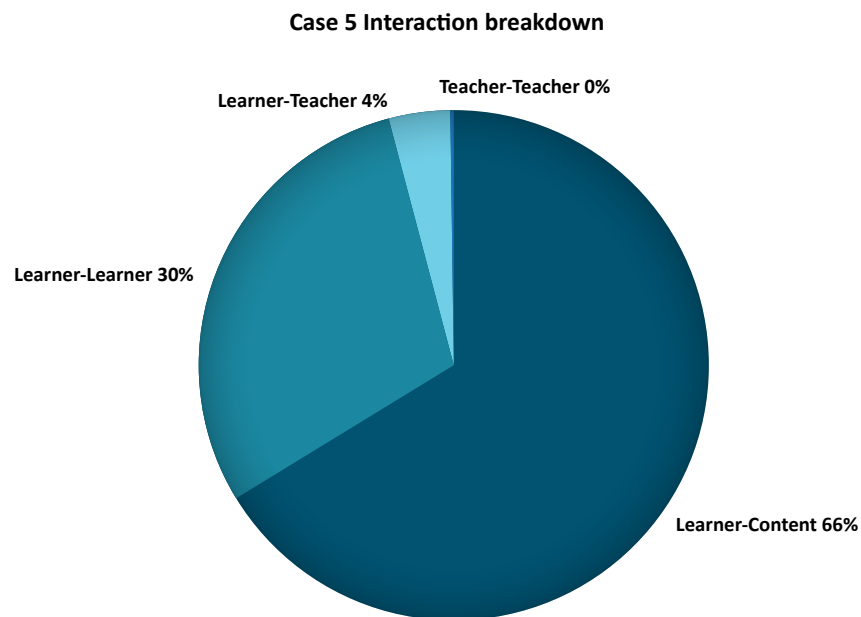


Figure 5.18: Case 5 interaction breakdown

While retrospective analysis of individual cases such as these is possible without the application of analytics, the inclusion of institutional averages provides unique perspectives on the context in which these cases are situated. The ability of analytics to relatively quickly provide empirical evidence of how students are interacting within university systems is comparatively new and is a potential 'gold mine' for researchers when used in conjunction with qualitative methods. This study has used analytics and a more traditional qualitative method to analyse how students were interacting within LMSs and how they constructed and reconstructed knowledge through these interactions.

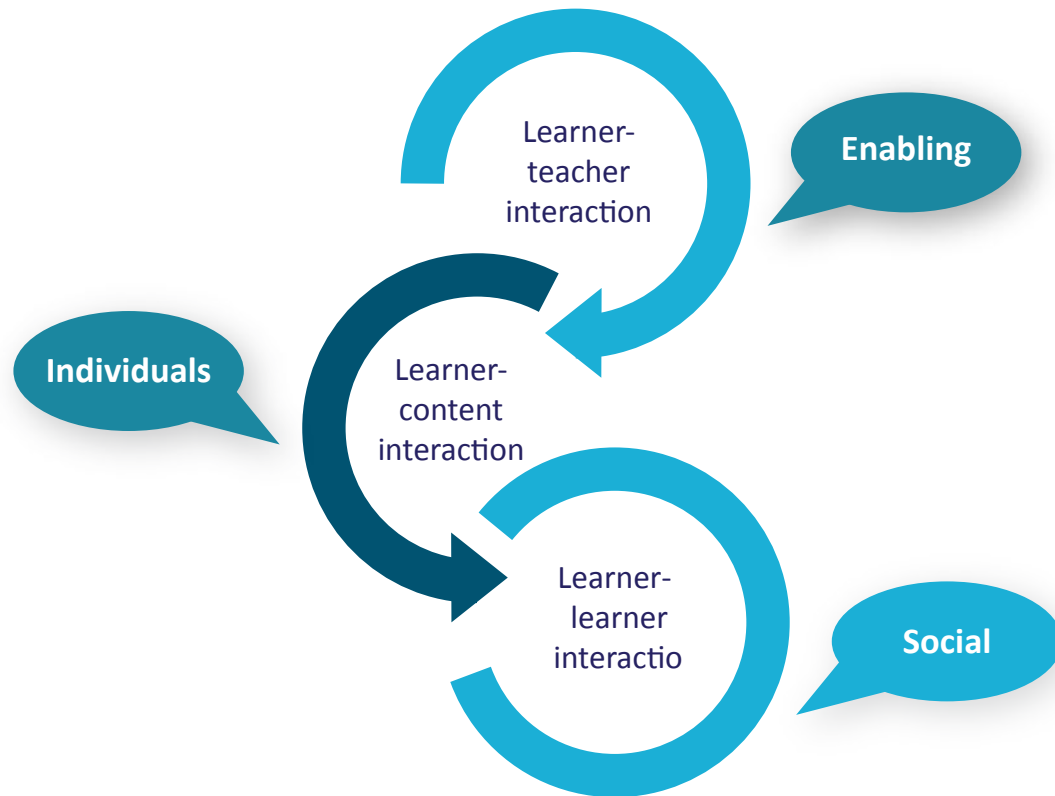


Figure 5.19: Interactions—enabling, individual, social

Moodle™

Construction and reconstruction of knowledge

The findings of this study suggest that the relationship among learner-teacher, learner-content and learner-learner interaction is perhaps more complex than Anderson (2008) has hypothesised. Anderson's ongoing work (Miyazoe & Anderson, 2010), cited in Chapter 2, posits that “deep and meaningful [online] learning is supported as long as one of the three forms of interaction (learner-content, learner-learner, learner-teacher) is at a high level. “The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience” (Miyazoe & Anderson, 2010, p. 94). This view is not supported by the findings of this research. By contrast, the findings of this study lend support for the work of Garrison and Cleveland-Innes (2005), who suggest that it is the interplay and mutual reinforcement among the different types of interaction that allow the learner to achieve higher-order thinking and critical engagement with what they are learning.

Figure 5.19 endeavours to illustrate the interdependent relationship of each type of interaction based on the analyses of the cases in this research. The diagram presents learner-teacher interaction as enabling and an activity that serves to set the tone and create conditions that facilitate and promote all forms of learner interaction. Learning activities that engender learner-content interaction have, as previously discussed, been found to support and/or

promote individual rather than social or interactive learning. Interactive learning in conjunction with learner-content interaction has been found to facilitate deeper levels of understanding and appreciation for individual knowledge experience and diversity (Case 3 and Case 5) and, in some cases, lead to personal and collective transformation, as evidenced in Case 5.

Miyazoe and Anderson (2011) propose two theses of interactions in online learning based on Anderson's (2003a) earlier work:

Thesis 1. Deep and meaningful formal learning is supported as long as one of the three forms of interaction (student-teacher; student-student; student-content) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience.

In Case 4 in this study, learner-content interaction was, analytically speaking, found to be present in relatively high levels compared with institutional averages. Although learner-content interaction was present at less than average levels, learner-teacher interaction was, institutionally speaking, relatively high. Even so, deep and meaningful learning was not observed within this course. By contrast, in Case 3 and Case 5, which had higher levels of learner-learner with lesser levels of learner-content interaction, meaningful learning in fact occurs. This would suggest that learner-learner interaction is crucial to deep and meaningful learning in online line courses.

The authors also posit that:

Thesis 2. High levels of more than one of these three modes will likely provide a more satisfying educational experience, although these experiences may not be as cost- or time-effective as less interactive learning sequences. (Miyazoe & Anderson, 2011, p. 1)

Learners in Case 4 and Case 5 certainly valued interactions with peers, content and teachers. Since the initial framing of the interactions equivalency theorem, it has been used by researchers around the world. As a result, findings have shifted perspectives beyond the original three dyads (Anderson, 3003a) of the student's perspective; that is student-teacher, student-student, and student-content relationships. The roles and relationships of teachers (teacher-teacher, teacher-student, teacher-content) and content (content-student, content-teacher and content-content) are now emerging as significant considerations and two further theses are now proposed:

Thesis 3: Deep and meaningful formal teaching is supported as long as one of the three forms of interaction (teacher-student, teacher-content, teacher-teacher) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience. (Miyazoe & Anderson, 2011, p. 1)

The results of this study suggest that it is the nature of the teachers' interaction rather than the level that is important, although the design of each course in this study constituted an intervening condition that determined the types of learner interaction that students engaged in. This conclusion lends further support for the views of Garrison and Cleveland-Innes (2005).

Thesis 4: Deep and meaningful formal teaching and learning are supported as long as one of the three forms of interaction (content-student; content-teacher; content-content) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience. (Miyazoe & Anderson, 2011, p. 1)

Similarly, thesis 4 is not supported by the findings of this study. Examples can be drawn from the impact of the perceived lack of support from the teacher in Case 3 and the deep learning that occurred as a consequence of the integration of learner-learner and learner-content interaction in Case 3 and Case 5.

Based on the results of this research, a number of guidelines for learner interaction in online courses have been developed; these are presented in Table 5.2.

Learner-teacher	Learner-content	Learner-learner
<ol style="list-style-type: none"> 1. May be used in isolation or in conjunction with learner-content and/or learner-learner interaction (to achieve positive learning outcomes) Conditions 2. Opportunities to utilise synchronous and asynchronous communication 	<ol style="list-style-type: none"> 1. May be used in isolation or in conjunction with learner-learner and/or learner-teacher interaction to achieve positive learning outcomes Conditions 2. Opportunities to utilise asynchronous communication 	<ol style="list-style-type: none"> 1. May be used in isolation or in conjunction with learner-content and/or learner-teacher interaction to achieve positive learning outcomes Conditions 2. Opportunities to utilise synchronous and asynchronous communication 3. Opportunities to collaborate in large and small groups
Intervening conditions Role and responsibilities <ol style="list-style-type: none"> 1. To align learning outcomes, learning activities and assessment items 2. Set tone and establish conditions conducive to interaction and learning in particular online contexts 3. Utilise a range of teaching and learning strategies to achieve intended educational outcomes and facilitate construction of particular types of knowledge 	Intervening conditions Educational aim <ol style="list-style-type: none"> 1. Facilitates development of individual knowledge and understanding Learning outcomes <ol style="list-style-type: none"> 2. Primary emphasis individual construction of knowledge Assessment Knowledge/understanding/ application <ol style="list-style-type: none"> 3. Individual review of course material and/or completion of individual learning activities 	Intervening conditions Educational aim <ol style="list-style-type: none"> 1. Facilitates development of shared knowledge and understanding 2. Offers exposure to diverse perspectives, knowledge understanding and/or skill Learning outcomes <ol style="list-style-type: none"> 3. Primary emphasis social construction of knowledge Assessment Knowledge/understanding/ application <ol style="list-style-type: none"> 4. Individual review of course material and completion of group learning activities 5. Task oriented activities lead to task orientated interactions
Actions/interaction Enabling	Actions/interaction Knowledge construction <ol style="list-style-type: none"> 1. Reflection Articulation	Actions/interaction Relationships development <ol style="list-style-type: none"> 1. Relationships may be developed in large or small groups 2. Increased sense of belonging and sense of community developed in small groups Knowledge construction & reconstruction <ol style="list-style-type: none"> 3. Reflection 4. Internal negotiation 5. Articulation 6. Social negotiation

	Consequences 1. My understanding	Consequences 1. My understanding 2. Your understanding 3. Our understanding
Delivery guidelines 1. Attention to the affective needs of learners is required (psychological and material support) 2. Learners with life/ industry knowledge and/ or experience at PG level continue to require academic support 3. Satisfaction based on learner centred rather than teacher centred approach	Delivery guidelines 1. Most effective when used in conjunction with learner-learner interaction	Delivery guidelines 1. Most effective when used in conjunction with learner-learner interaction 2. Sustained interaction required to develop learning relationships 3. Breadth of knowledge and depth of understanding is greater in groups that engage in negotiation or meaning making processes.

Table 5.2: Curriculum development & delivery guidelines for Learner interactions in online contexts

Conclusions are now drawn as the third action research cycle resolves, with this final chapter in the report summarising the project activities and deliverables. Conclusions and the potential for further investigations are based upon findings from the following chapters.

Chapter 2: a literature review (a critically informed account of interactions and the use of learning analytics in online environments as well as an audit of scholarly peer reviewed outputs in the field of online learning in higher education);

Chapter 3: an innovative research approach utilising mixed methods of data collection and analysis to construct cases within an action research process;

Chapters 4 and 5: a dependable, credible and trustworthy data set from which a conceptual model and a set of evidence-based curriculum development and delivery guidelines are proposed.

Chapter 6 Conclusions

6.1 Conclusions

Conclusions are clustered around four core findings. First, the rate and nature of change in technology use in Australia's tertiary sector will continue to be unrelenting with profound effects on the work of teachers, students, technologists and administrators. Second, research in this area is dispersed among the disciplines and divisions of institutions; and diversely different in its theoretical and methodological orientations. Third, education is about good learning experiences for students and, in the pursuit of that outcome, education researchers can learn how to work with students and one another to investigate their pedagogical practices and curriculum design frameworks. Finally the fourth, and the most pertinent to the teaching academic in higher education, is the misplaced emphasis on content creation and learner-content interaction in course design.

This project's investigations into learning interactions were conducted within online learning management systems (LMSs)—two institutionally different versions of Moodle™, and one version of Blackboard™. The LMSs were operated across two institutions and data were mined from static course records covering a five-year period 2006-2011. Courses were selected for intensive examination, resulting in the construction of five cases within a collective case study. Each case was developed to investigate the effects of learning analytics as a quantitative indicator of interactions within LMSs. In addition, three of the cases were expanded to include a grounded theory perspective on the collection, analysis and representation of qualitative data. Through this approach, the efficacy of a mixed-method approach to both data collection and analysis activities was subjected to critical review.

The design features of LMSs are undergoing continuous change as more 'plug ins' become available and interfaces become 'flatter', thereby facilitating easier navigation around learning sites. The conclusion from this project is that these LMS design features continue to favour learner-content interactions. This is despite the admittedly large learner-learner interactions that were identified; however, closer qualitative analysis supported the conclusion that this effect is achieved where interactions are mandated as part of assessment requirements. Now, these mandated interactions may be of the learner-content variety and, in some instances, were learner-teacher; but overwhelmingly, when linked with assessment requirements, learner-learner interactions were significant.

The use of an action research orientation to this project has been efficacious because it disclosed the research process to be a messy business, with the conclusion that, no matter how clear the plan on entry, there are always negotiations to be undertaken and compromises to be made in the process of resolving difficulties that arise. Chapter 3's depiction of the three action cycles summarises this process. In Cycle 1, it was the different institutional boundaries that had to be breached to gain access to data. In Cycle 2, it was the researchers' diversely different theoretical and methodological frameworks impacting on data collection and analysis methods

that needed resolution. In Cycle 3, the challenge of constructing cases, guidelines and a model engaged the problem of drawing and verifying conclusions responsive to the project brief.

The third significant finding highlights the symbiotic research learning that has occurred throughout this project. Learning analytics may be a powerful tool for diagnosing patterns of interactions and the nature of some of those relationships among learners, teachers and content that may indicate when students are struggling or at risk of not completing a course. Yet, it does not tell the individual teacher or student the value or significance of those patterns for teaching and learning. To develop some insights into the reasons for those patterns, with processes and consequences from interactions in online learning contexts, and the qualitative richness from content analysis, a particular version of social network analysis, categorisation and thematic analysis was needed.

Finally, the fourth significant finding of this report, and the finding that is perhaps the most pertinent for the teaching academic, is the misplaced intense focus on content in learning design. The overarching pattern that was apparent in the learning analytics data presented in this report (Figures from Chapter 5) suggested that, of the three interaction types, learner-content interactions were most prevalent within each of these learning management systems. This contradicts literature that shows how important learner interactions with their teachers and other learners are to quality learning and teaching (Chao, Hwu, & Chang, 2011; Clark, Beer, & Jones, 2010). Coates, et al. (2005) state that this may be because, to date, LMS-focused research has been based on an overly simplistic understanding of the relationship between teachers, knowledge and student learning.

Even the architects of LMSs such as Moodle™ are aware that despite the benefits of learner interaction between teachers and peers, many course designers remain focused on the content delivery:

“Many of our users love to use the activity modules (such as forums, databases and wikis) to build richly collaborative communities of learning around their subject matter (in the social constructionist tradition), while others prefer to use Moodle as a way to deliver content to students (such as standard SCORM packages) and assess learning using assignments or quizzes.” (<http://moodle.org/about>)

Irrespective of the reasons, the high proportion of learner-content interaction occurring within LMS suggests that course designers and teachers need to better promote learner-learner and learner-teacher interaction when developing or delivering courses via the LMS. However, a shift of focus to human (learner-learner and/or learner-teacher) interaction may impact the time and effort students spend engaging with course content.

A fascinating revelation emerged from Case 5 (Chapter 5), which had a learning design focused on learner-learner interaction, rather than content. It had proportionally the highest learner-content interaction of all the cases. Furthermore, taking into consideration the number of students (n=20) enrolled in the Case 5 course and the number of learner-learner interactions

that had occurred, Case 5 had by far the highest learner-learner interactions of all the cases. The learning design achieved its goal of increasing learner-learner interaction, yet this increase in learner-learner interaction clearly did not adversely impact on the learner-content interaction. In fact as previously stated, Case 5 had the highest proportional learner-content interactions of all the cases. This suggests that refocusing effort in course design toward improving or heightening interactions among learners and teachers will, as a consequence, engage the students with the content. Thus, teaching academics' emphasis on content creation and learner-content interaction to engage learners is misguided and their time is better spent on embedding human interactions into their course design.

In this project, these two research trajectories were brought together through a coordination of the multiple skill sets and knowledge of a multidisciplinary team of education researchers. This is significant because, as Siemens (2012, p. 2 of 5) observed recently, "much of the innovation in LA [learning analytics] [is] happening in the vendor space ... [and] unfortunately, many vendor-driven innovations are closed and do not meet the basic needs of researchers: open, testable, accessible, and improvable algorithms and tools". Institutional administrators may be quite easily seduced when presented with vendor tools that promise to alleviate problems with pesky teachers who may not seem to be embracing their preferred shift from sage on the stage, to guide on the side, to conversationalist in the cloud.

6.2 Learning sites and systems

It is timely to revisit those four theses of learning interactions (Miyazoe & Anderson, 2011) in the light of findings from this project. Furthermore, education researchers in multidisciplinary teams may usefully examine in depth the design variables that impact on particular combinations of interactions in and through a range of Web2.0 interaction tools (Fidalgo & Thorman, 2012). Figure 6.1 depicts the limitations of this current project in that respect. It shows the participants in these online interactions able to access that learning only through tethered enrolment (students) and employment (teachers) status. With course profiles accessible, the LMS dashboard primed, and some of the contextual and all of the intervening conditions for learning set, the course can be launched on its term's or semester's learning journey.

Some of the interactions are discernible—for example, interactions among: learners and teachers; other learners; and what counts as the course content. Yet there are other technologically mediated interactions taking place through the portals of the participants' (learners' and teachers') relationships. The existence of these interactions is known through electronic transcript traces within the LMS itself when, for example, Case 4 participants talk of sharing skype, facebook, telephone, email, and mobile telephone text communications.

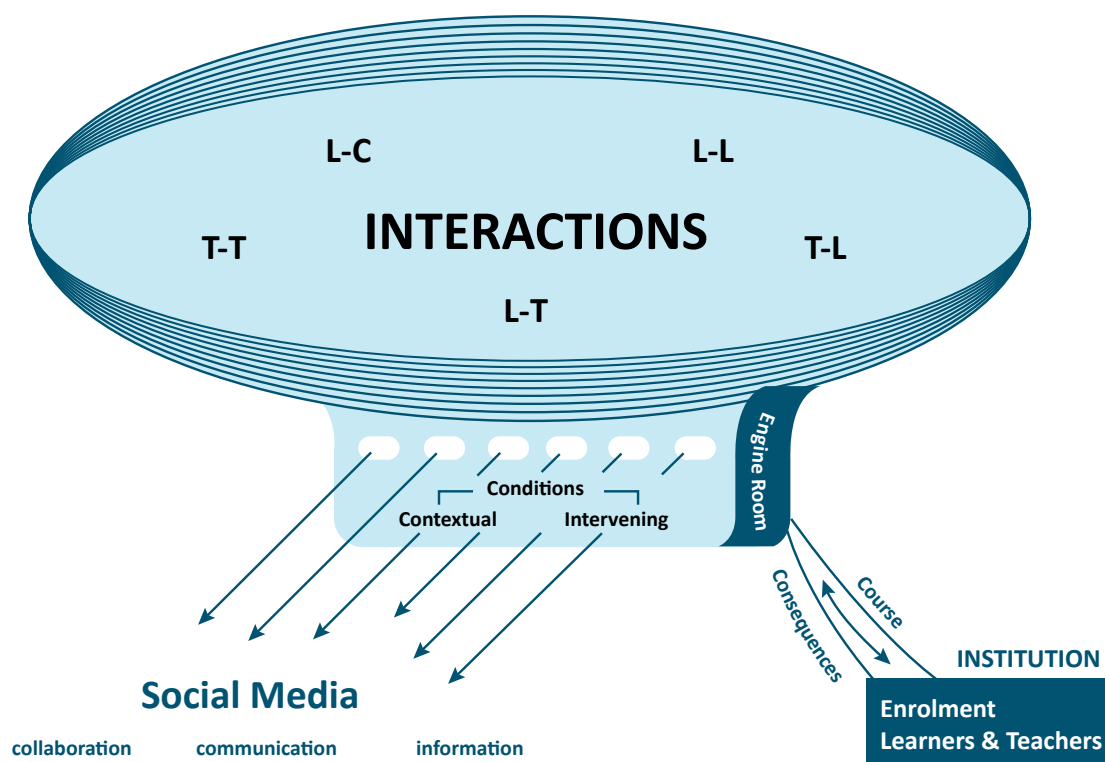


Figure 6.1: The LMS—internal & external learning interactions

The design paradigm for teaching and learning via an (LMS) such as Moodle™ or Blackboard™ is unique to that system. In the twenty-first century, LMSs are the dirigibles of online education. Like the airships of a century ago, they are known for their skeletal rigidity, impermeable membranes filled with volatile gaseous variability of knowledge constructions, yet with gondola windows that enable passengers to connect to other worldly knowledges, while tethered to institutionalised entrance and egress points. This idea is not new; in fact, for the last decade researchers have argued that an LMS is the wrong place to start e-learning (Siemens, 2004).

However, in the absence of a more agile electronic tool that services both the pedagogical needs of teachers and the legalised risk management affordances of education institutions that a LMS currently does, then it may remain at the forefront of curriculum design and delivery into the foreseeable future. Thus, it is reasonable and even necessary to continue researching deep in the very fabric, frame and engine room of the dirigible as it ferries teachers and learners to and through university courses. Yet that should not be the limit to such research because vendors will continue to develop data mining and LMS products, students and teachers will continue to use other mutually convenient communicative technologies, and institutions will continue to seek to mitigate risk exposure as ordained by regulatory requirements for their very existence.

The rich data corpus from which the individual cases and cross case analyses were constructed in this project was brought into being only through intensive data mining for which interrogative scripts had to be especially written to elicit base-level information from course data repositories. From there, the patterns of interactions could be identified and some of the consequences inferred. The transfer of these large course archive data sets into an electronic repository

facilitated the management of the in-case and cross-case categorical analysis to be undertaken with respect to the interaction processes and some consequences. This process enabled the comparison between a single quantitative analytical method (learning analytics) and a mixing of that with a qualitative analysis method. However, in all five cases, the qualitative content analysis of key documents—such as course profiles and handbook entries together with demographics of gender, age and grades mined from the course archives—contextualised the statistical learning analytics and qualitative analyses that were then presented.

This process is cumbersome and time consuming. It is one that already time-poor educators cannot even consider, even if they possessed the considerable requisite technical skills (for the analytics) and qualitative categorical analysis capabilities (for interrogating the texts produced). Yet, the findings are needed. First, higher education providers operate in an environment of globalised hyper-competition and their managers are accountable to nationalised quality agencies and international ranking systems. Thus, any evidence that they are responsible and responsive corporate citizens is paramount. Second, online and distance education via electronic learning management systems (e-LMSs) has become part of a globalised learning experience for students in undergraduate and postgraduate accredited and credentialed learning.

In many instances, the e-LMS environment is enriched from within through collaborative workspaces mimicking classroom tutorials, audio podcasts and video clips; and not via social networking technologies such as skype, facebook, blogs, wikis, telephones and mobile texting. Both learners and teachers are personalising technology use to suit diverse contexts in which their learning and teaching take place. Cloud computing now facilitates scholarly collaborations and file storage (it was used in this way in this project) as it is creating new spaces for the storage and sharing of teaching and learning resources. Third, connectivity among such technologies and the e-LMS dirigible will no doubt continue to evolve so that it, too, will become integral to curriculum development and pedagogy in tertiary education.

For teachers, coordinators of courses and programs, educational technologists and administrators close to the engine room of education delivery, the consequences of knowing the patterns and processes of learner-learner, learner-teacher and learner-content interactions are relevant and crucial for their scholarship of teaching, research and information management of programs. If an educator-researcher process can be built-in, rather than being bolted-on as in this project, then academics will better understand their practice, its impact on their students and the relationship among teaching, learning and the fields of knowledge and work for which the university courses are intended.

6.3 A contrary complexity

In this area of education research, in particular, there exists a contrary complexity around notions of online learning interactions as promulgated through formal education institutions such as universities. This contrariness and aspects of its complexity emerged throughout the project. During the ongoing review of the literature, different theoretical frameworks and methodological approaches in this multidisciplinary field emerged. They reflect diverse stakeholders in this

area of education research: technologists, teachers, mid-level administrators, institutional managers, vendors of hardware and software, information systems librarians and, last but by no means least, students. Students as learners are for the moment taking what they are given in terms of online interaction options while at the same time augmenting those options with their own negotiated interactions among themselves and with others they consider significant for their learning. They have proven to be resilient as learners because, even if the teacher is absent for a period (Cases 2 and 3) or if there is discord with a teacher or tutor (Case 3), their learning continues. The contrariness of this situation is evident when juxtaposed against the control mechanisms imposed around what counts as learning and how it is to be measured (Case 5).

In all cases, interactions were formulated from within institutional naming of the learning. This means that institutions categorised courses differently—for example: online as distinct from on-campus; flex—a contraction for flexible delivery that was itself a euphemism for both internal (face-to-face) and external (distance). This nomenclature itself was not found to provide any noticeable impact on the interactions experienced and it was more of a distractor in the first research cycle as it was thought necessary to ensure a range and balance of types of offerings within a notional consideration of ‘distance education’—albeit that distance is no longer of use as a designator of distinction in such an investigation.

Online learning interactions were also designated as occurring within levels of learning—for example, undergraduate or postgraduate, with one case servicing both levels (Case 1). There were also other varying distinctions among pre-service and in-service, on-the-job, and work integrated learning evident in all cases. Yet findings suggest there were no discernible major differences among these levels such that conclusions could be drawn for ongoing practice in curriculum design and/or pedagogy that were distinct to either level or designations. There were, however, distinct issues of who was considered ready to participate in learning (Case 3). While not extracted specifically from the other postgraduate level course (Case 2), there would have been particular preparatory levels of learning necessary to gain entry to that course because of its discipline.

Teachers differ in their preferences for different sites and types of interactions. As well, some teachers want to be able to observe all online interactions, while others appear to be not so concerned with observable online behaviours. This may be related to individual teachers’ perceptions as to how courses are best designed, their knowledge of potential students as learners, the discipline differences impacting on those decisions, the specific purpose for which each course is designed and its location within a range of programs or one particular program. In one case, all interactions among learners and teacher were to occur within the LMS (Case 5), while in another case (Case 4) learners were encouraged by the teacher to communicate outside the LMS via telephone, telephone texting, skype, email, facebook, and face-to-face as well as online interactions within the LMS.

In the future, these LMSs may either become totally superseded or merge with complex adaptive systems as but one among a number of agents that evolves, changes and adapts in the process

of interacting with other webs of socio-material relationships (Beer & Jones, 2012; Benson & Palaskas, 2006; Boustani, et al., 2010). In the short term, they will probably continue to evolve in the interstitial spaces between top-down/teleological and bottom-up/ateleological education management environments functioning as either accelerators or brakes to learning and teaching (McConachie, Danaher, Luck & Jones, 2005; Siemens, 2012).

This project has crafted and trialled a forward-looking research approach in its use of learning analytics and qualitative methods to harvest and interrogate learning interactions in LMS courses. It is clear that learning analytics promise data-driven decision-making for the macro-level institutionalised strategic management of human and physical resourcing in universities. However, with the co-construction of new knowledge and skills, further refinements of this project's research approach have the potential to be an equally powerful tool for enabling teachers and learners to evaluate for themselves, the significance of learning analytics data emerging throughout the lifespan of that course (Beer & Jones, 2012).

The embedding of case constructions within an action research process as undertaken in this project has also provided methodologically significant professional learning opportunities for the team's early career education researchers. Thus, it has fulfilled important goals of the DEHub consortium through: (1) building a future focused research capacity (four early career education researchers); (2) developing resources to support and promote research, practice and development in/of distance education (research approach with mixed methods case studies); (3) disseminating research to inform and influence policy and improve practice (intra- and inter-institutional seminars, wiki researcher site, publications and international conference presentations).

Theorising this research approach in the context of online interactions is just in its infancy because it has yet to engage seriously existing notions of theorising that include, but are not limited to: social constructivism (Vygotsky, 1978 & many others); communities of inquiry (Rourke, Anderson, Garrison & Archer, 1999); domains of social, cognitive and teacher presence (Swan, 2003); silence (Amundrud, 2011); and complexity theory (Lemke & Sibelle, 2008). The challenge in such an agenda is to construct "concepts and procedures derived from the study of other complex dynamical systems to analyzing systemic change in education" (Lemke & Sibelle, 2008, p. 118). Thus future research beckons while, in the meantime, it is hoped that educators of all persuasions will engage with the curriculum design and pedagogical possibilities emerging from this project.

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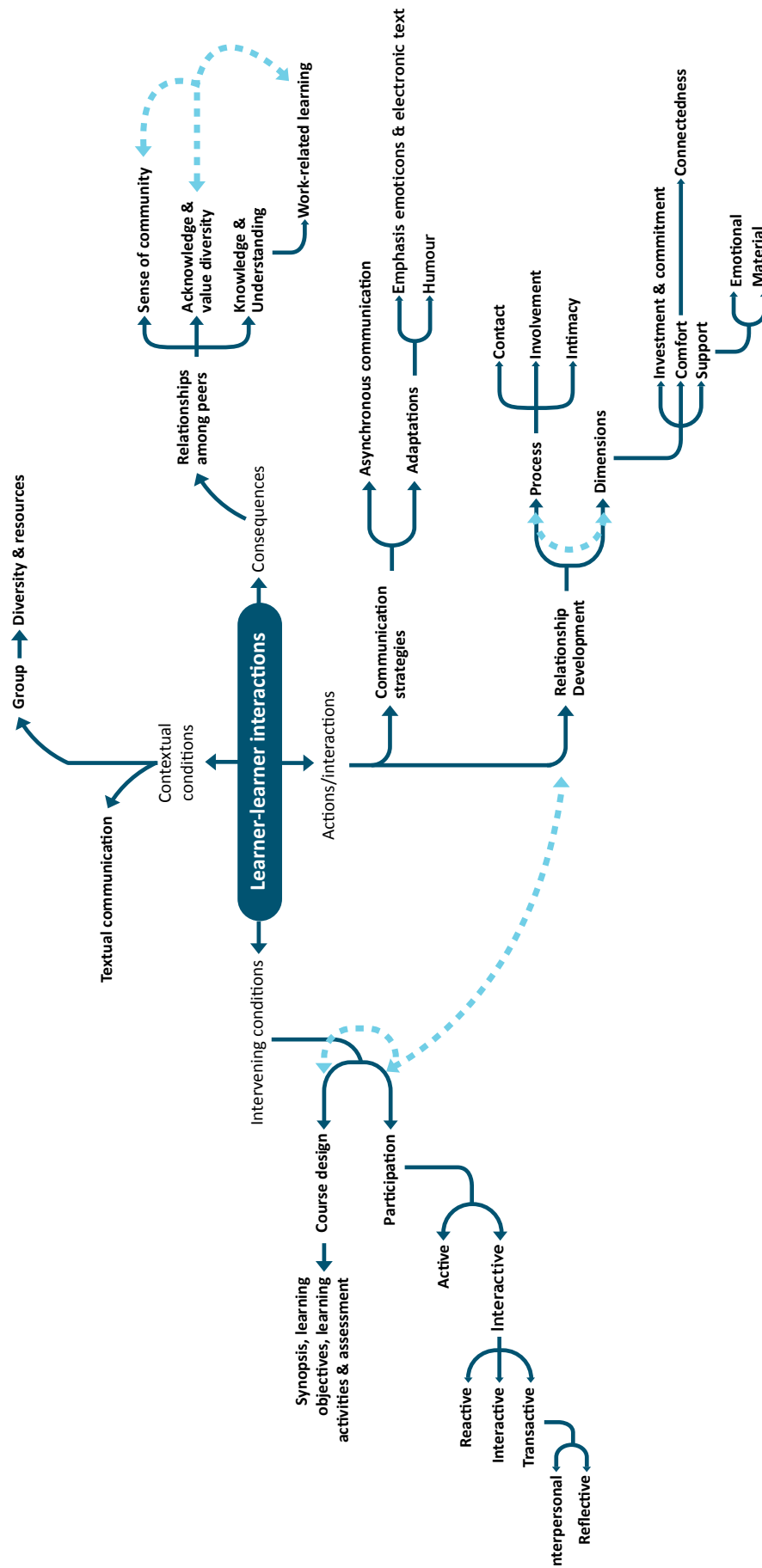
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Appendix A

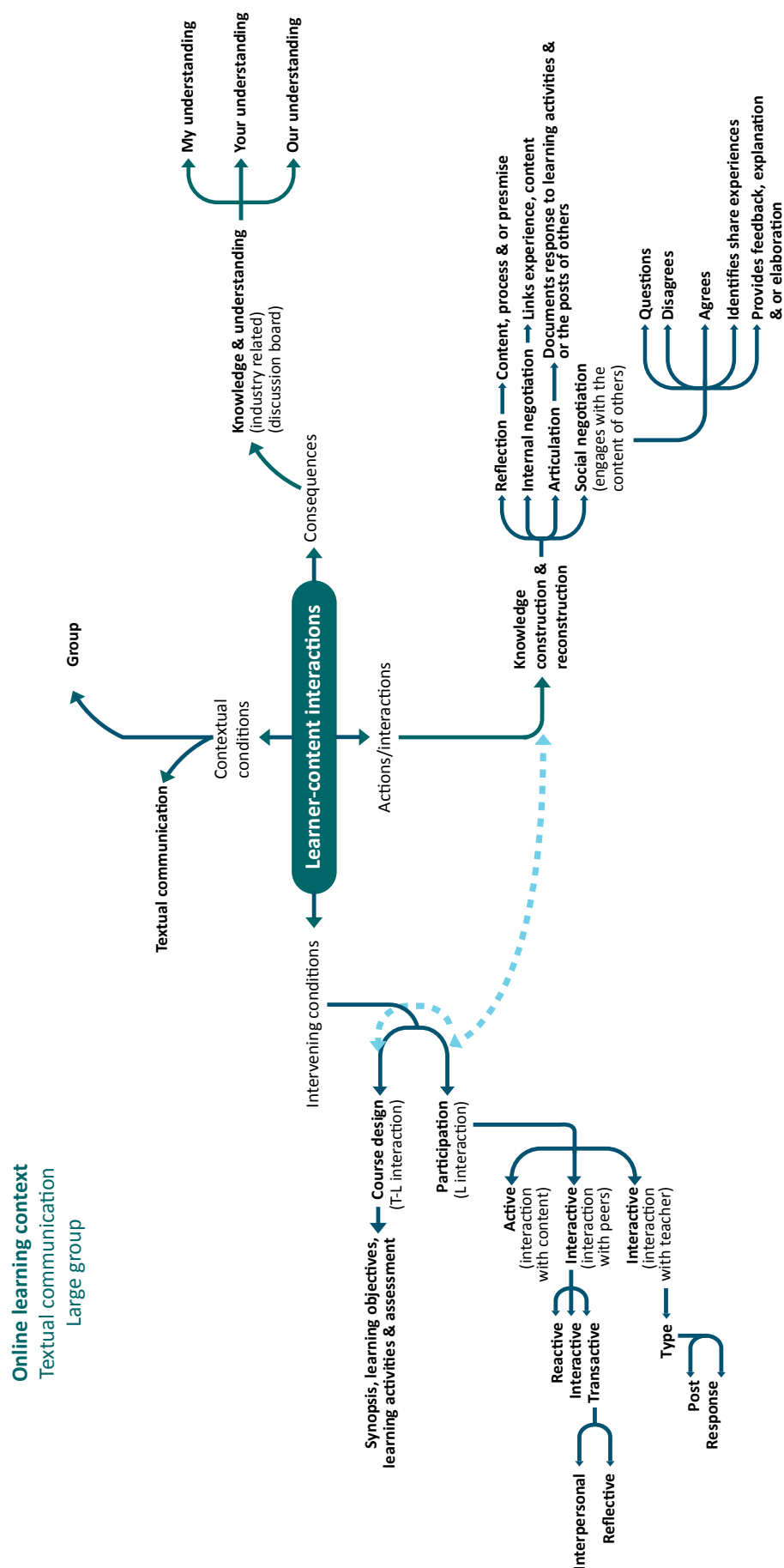
This Appendix contains detailed diagrammatic overviews of the three interaction types for three of the five case studies developed in Chapter 4. It is comprised of three sections for Cases 3, 4 and 5, and there are 3 diagrams for each section making a total of 9 diagrams, providing a detailed overview of the conditions, actions/interactions and consequences for each of the three interaction types: learner-learner, learner-content, and learner-teacher.

The diagrams depict the categories and subcategories associated with each of the three interaction types as a unit of analysis within each case. The range of properties and dimensions are identified to facilitate an understanding of each category and to show how they are linked. Green association lines are used to illustrate further connections between categories and sub-categories.

Online learning context
 Large learning group
 Textual communication

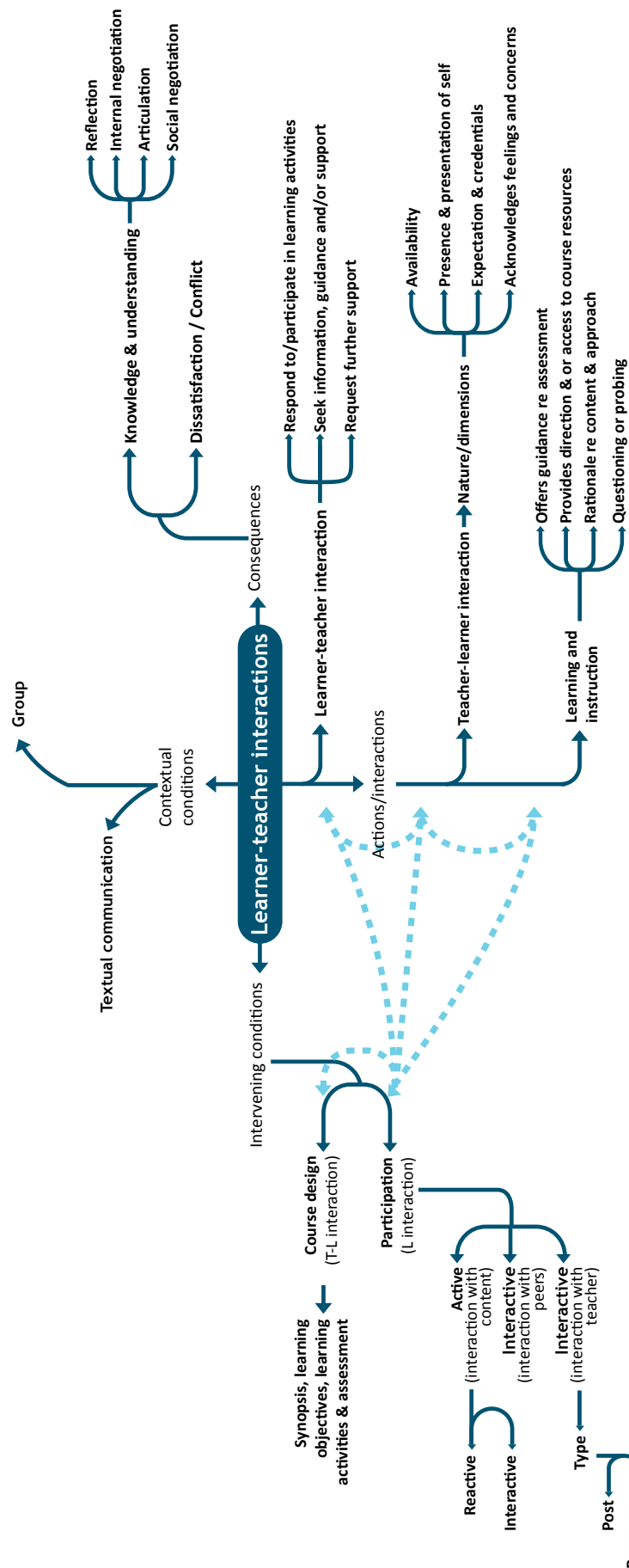


Overview of learner-learner interaction within Case 3



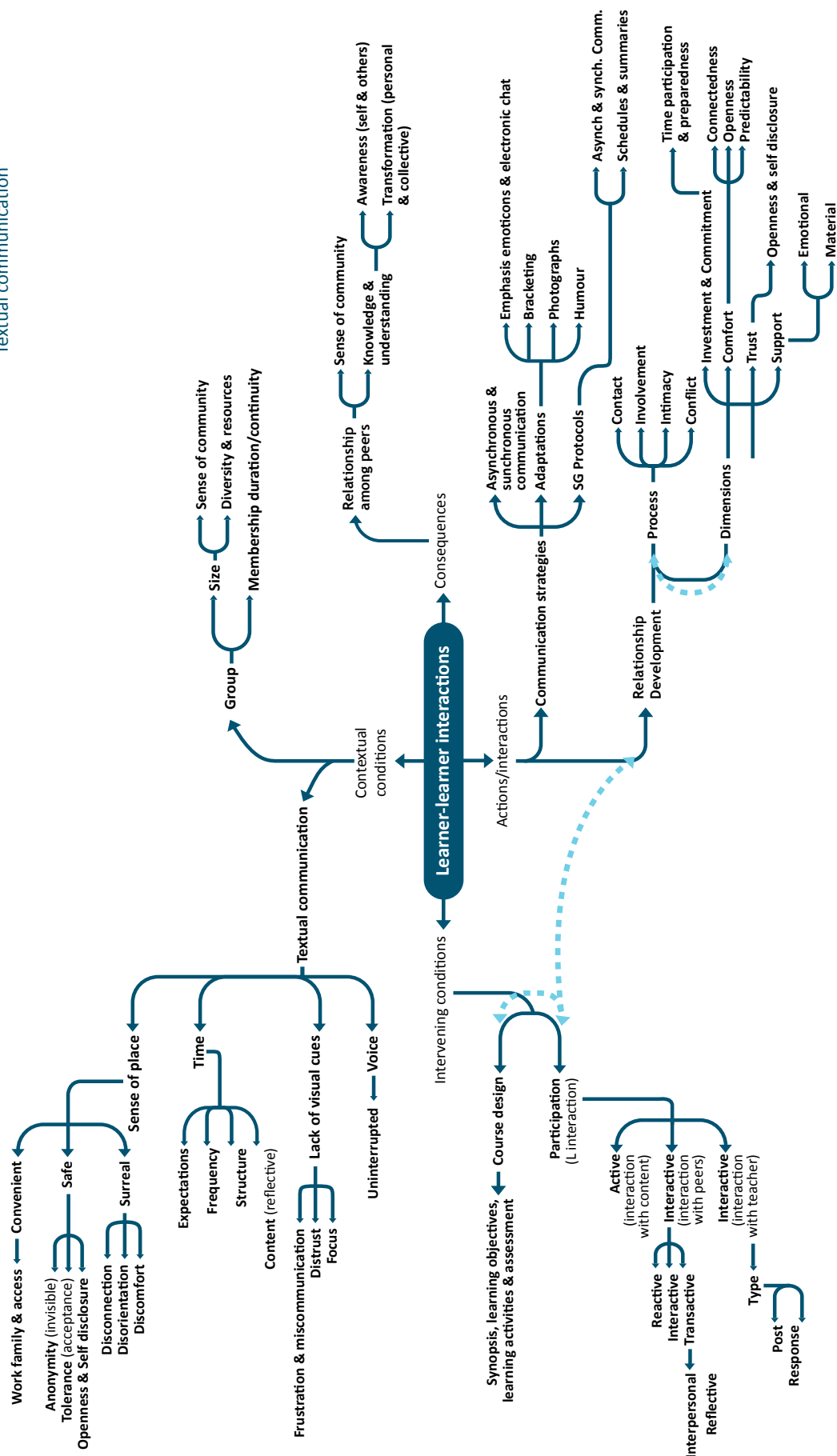
Overview of learner-content interaction within Case 3.

Online learning context
Large learning group
Textual communication

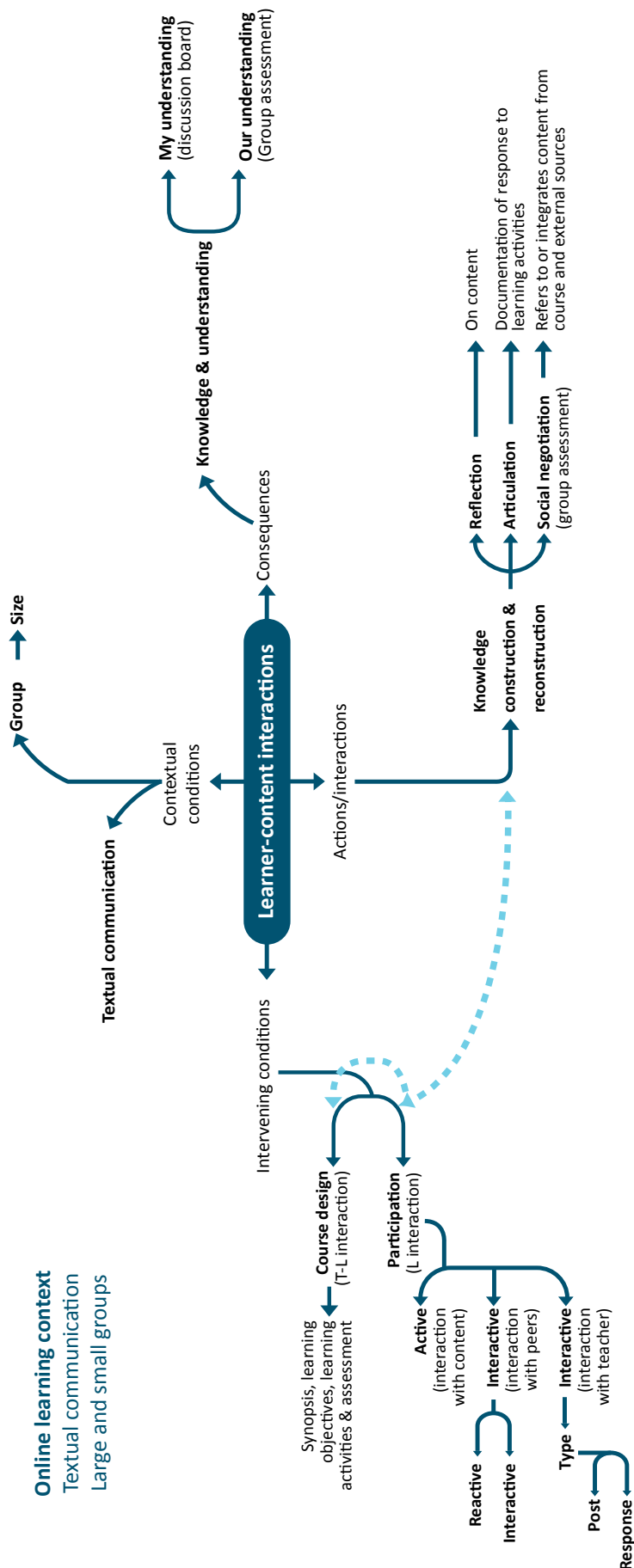


Overview of learner-teacher interaction within Case 3

Online learning context
Large and small learning groups
Textual communication

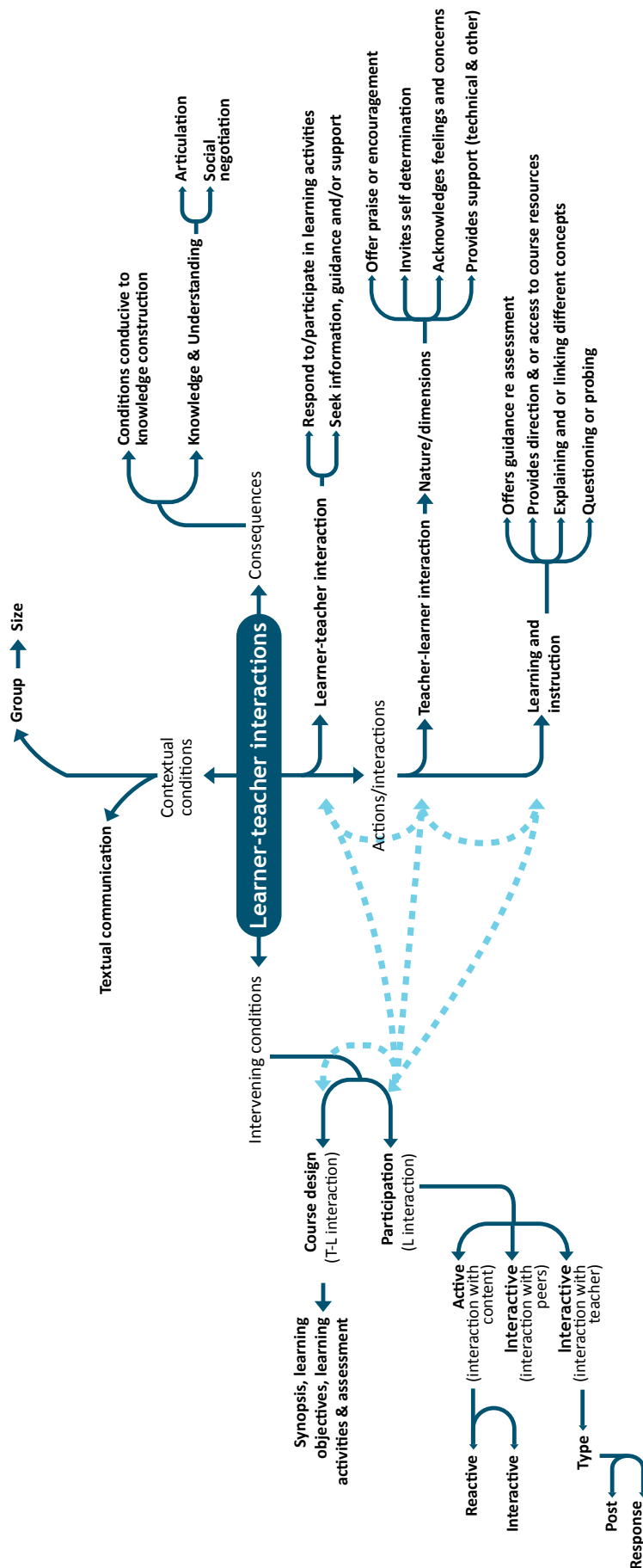


Overview of learner-learner interaction within Case 4



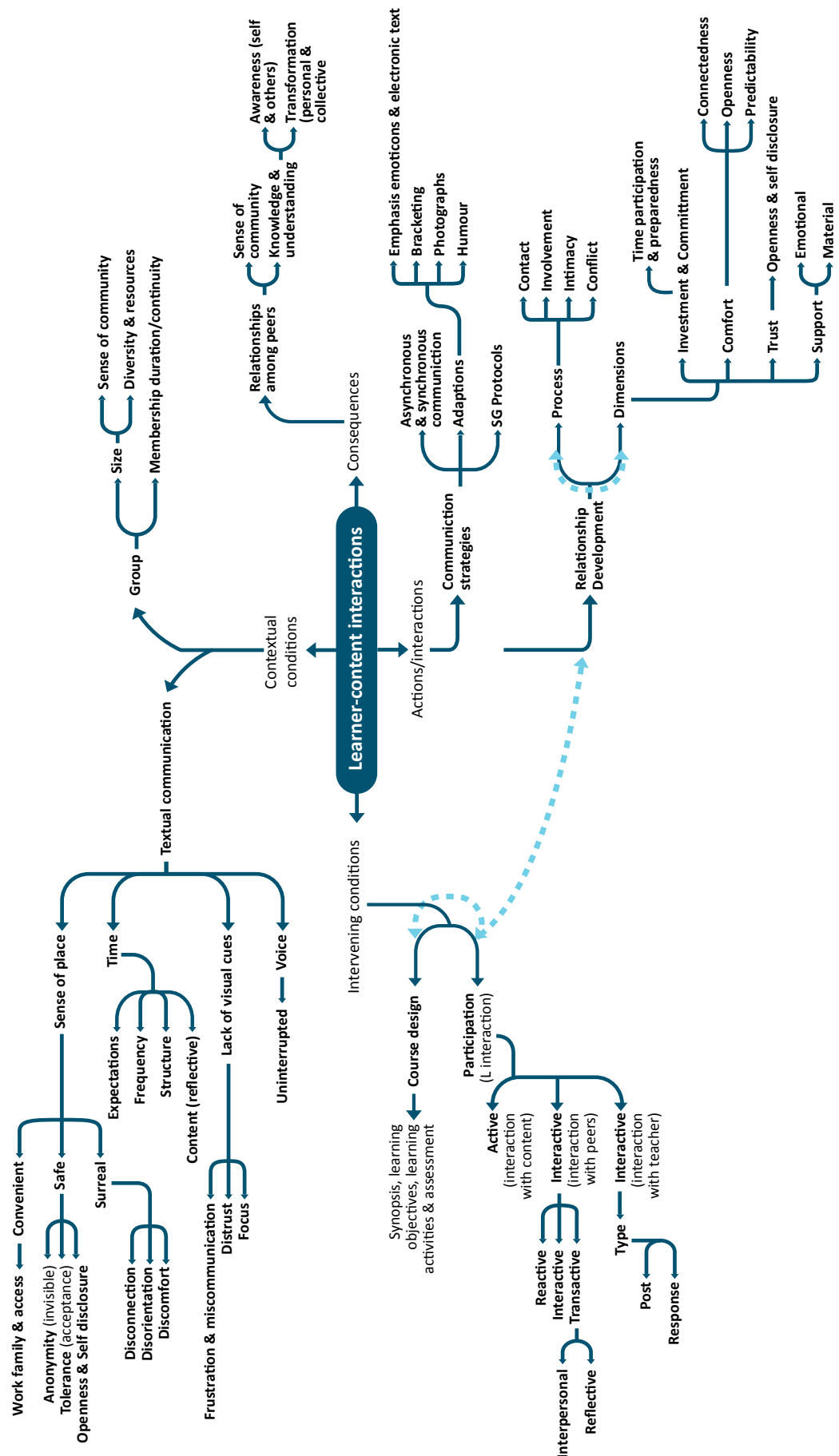
Overview of learner-content interaction within Case 4

Online learning context
 Textual communication
 Large and small groups



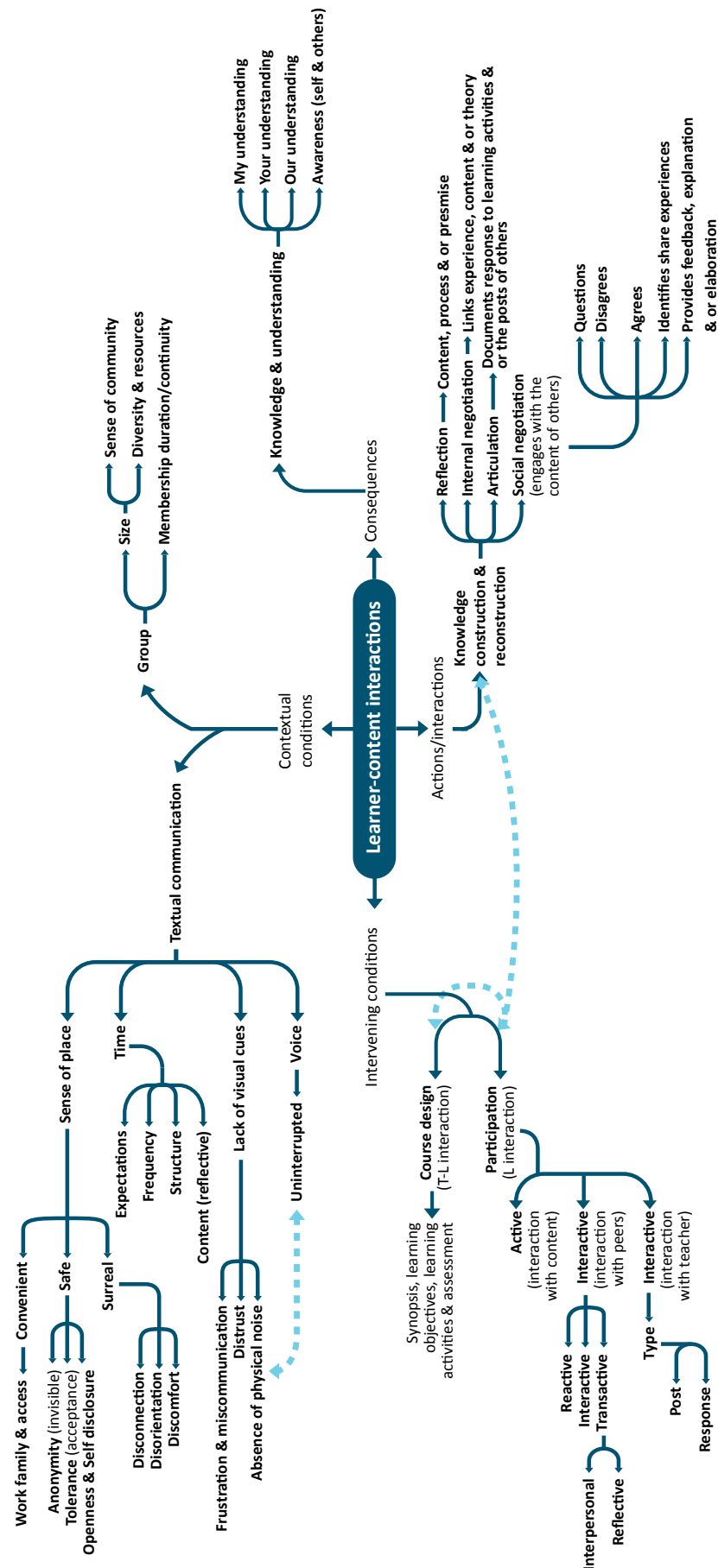
Overview of learner-content interaction within Case 4

Online learning context
Large and small learning groups
Textual communication



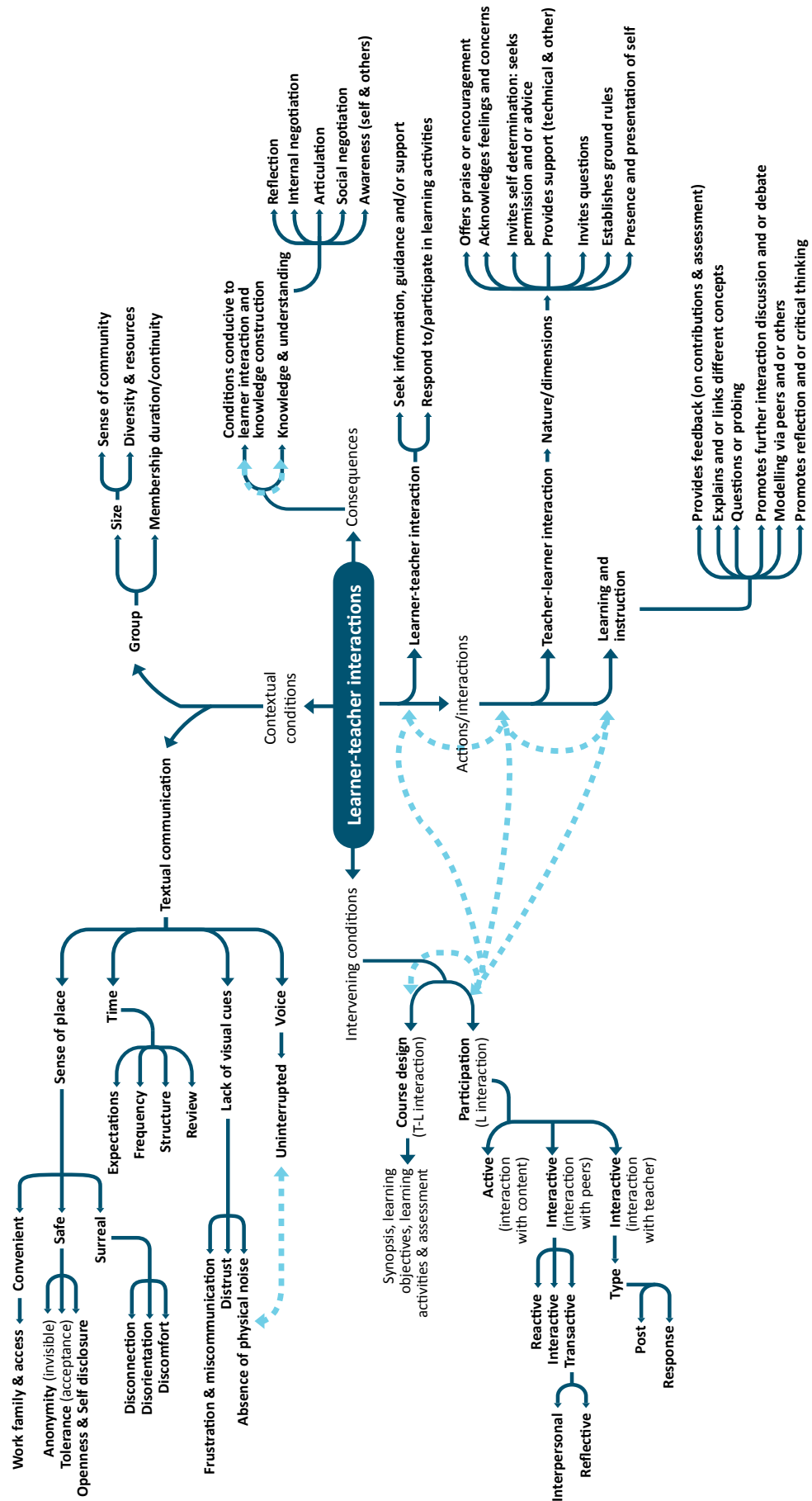
Overview of learner-learner interaction within Case 5

Online learning context
Large and small learning groups
Textual communication



Overview of learner-content interaction within Case 5

Online learning context
Textual communication
Large and small groups



Overview of learner-teacher interaction within Case 5

Learner, teacher and content interactions online:

A research evaluation of cross-institutional, multi-disciplinary distance education

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Acronyms and Abbreviations

CQU: University of Southern Queensland

DEEWR: Department of Education, Employment and Workplace Relations

DEHub: the Distance Education Hub

ICST: Information, Communication and Surveillance Technologies

LMS: Learning Management System

USQ: Central Queensland University

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1. LEARNER, TEACHER AND CONTENT INTERACTIONS ONLINE

The research evaluation reported here focuses on the Distance Education Hub (DEHub) Project entitled “Learning interactions: A cross-institutional multi-disciplinary analysis of learner-learner and learner-teacher and learner-content interactions in online learning contexts” (herein referred to as the DEHub Project).

The overarching purposes of the DEHub Project were to:

- a) conduct a systematic enquiry into the technologically mediated interactions of online course delivery; and
- b) construct understandings of and insights into the central relationship of education – teaching and learning.

In terms of priorities this DEHub Project addressed “interaction and communication in learning communities” as these relate to “curriculum design” and “professional development and faculty support”. In addition, this DEHub Project also worked to contribute to orthodox research and development approach by exploring research methodologies appropriate for investigating distance learning.

This DEHub Project’s beneficiaries were conceived as end-users. The key expected end-users for this DEHub Project include those in universities requiring “benchmark information” and “indicators” about students’ learning engagement within online courses. The Project’s end-users also include those who can best improve learning through their engagement in it, namely students and academics, with the latter including course coordinators, lecturers, tutors, markers, and specialist course designers. In relation to the issue of how learners interact in online courses, the main question addressed by this DEHub Project was: what are the patterns, processes and consequences of learner-learner, learner-teacher and learner-content interaction in online contexts?

The intellectual context for this particular DEHub Project was the use of academic analytics to examine academics and students' teaching/learning engagement within online courses. This is part of the use of learning management systems (LMS) to provide universities with benchmark information and an indicator of student engagement within online courses. The processes of and relationship between learner-learner interactions and knowledge construction have been studied within online courses.

The Research Proposal for this particular DEHub Project explicitly stated:

"The project will achieve the following outcomes:

- A *critical review* of course designs that are both conducive to and effective for teaching and learning in online university courses.
- A *conceptual model* to illustrate and explain the role of teaching-learning relationships in online interactions and knowledge construction in university courses.
- A *set of evidence-based curriculum development and delivery guidelines* that will enhance online teaching-learning relationships in online university courses.
- A *collaborative research partnership* between CQU and USQ.
- *Scholarly outputs* that will contribute positively to the research and publication quantum of both institutions and the DEHub consortium"(Research Proposal, 2011, p.3).

The Research Proposal (2011) stated that the project will achieve all of these outcomes between February 2011 and June 2012. It is always useful for all members of a research project team to be fully aware what the expected outcomes of their study are, and to have these as a key focus throughout the project.

2. METHODOLOGICAL ORIENTATION TO RESEARCH EVALUATION

This research evaluation was conducted in response to an invitation from Professors Patrick Danaher (University of Southern Queensland) and Roberta Harreveld (Central Queensland University) made on Saturday, 7 May 2011. These two Universities conducted a joint-venture project entitled, “Learning interactions: A cross-institutional multi-disciplinary analysis of learner-learner and learner-teacher and learner-content interactions in online learning contexts.” This research evaluation which commenced in May 2011 and concluded in July 2012 was funded by Department of Education, Employment and Workplace Relations (DEEWR) through the DEHub Consortium (<http://www.dehub.edu.au/>).

The research evaluators spent up to 10 days in preparation of the research evaluation plan, consultation with project managers and project team, collating and reviewing relevant evidence provided by the team, and writing this research evaluation report. The research evaluation entailed one visit to the Toowoomba Campus of USQ and one to the Rockhampton Campus of CQU. Data collected include semi-structured focused interviews with individuals and groups.

The core outcomes described in the DEHub Project proposal were a *critical review of course designs* (not a critical literature review); the production of an *explanatory conceptual model* and a *set of evidence-based curriculum development and delivery guidelines*. This DEHub Project proposal expressed the “will to achieve” an “explanatory model” of the relationship among course design, academics, students, content interactions and student learning in online courses. This “explanatory model” was expected to elaborate on the patterns, processes and consequences of these different types of interactions in online teaching/learning contexts. This model was then to achieve the establishment of a set of guidelines identifying conditions conducive to these interactions and “effective learning” in online courses. Both the “explanatory model” and guidelines are expected to be use by CQU and USQ to enhance the design of online courses, the learning and teaching experience of students and academics, and the learning outcomes of online, distance education. Dissemination of this DEHub Project’s results is meant to benefit the Australian and international higher education community. The research and teaching relationships

formed during this collaborative DEHub Project promise to lead to further opportunities for research-based knowledge production in this field.

Our method of evaluation focused on the project development as a learning journey for all the project team members, in particular the issues, problems and concerns they have to handle in the process of developing a cross-institutional and cross-disciplinary and multi-method research partnership. Respectful, evidence-based data analysis highlights the team members' own interpretations of these issues, problems and concerns. Descriptive coding and open coding were used in the first stage to analyse interviews and documents, in particular the interim project report and the final project report. The second stage of analysis as presented in this report focuses on evidence related to each of the projected outcomes. The third stage of analysis compared the evaluations of the interim and final project outcomes. The fourth stage provided a meta-analysis of a learning journey where the team members have engaged in a process of arguing around alternatives, shifting perspectives, refining the research methods and conceptual models. However, the sequencing of evaluating each of the Project's outcomes in Part 3 of this report accords with accounts of the project's general trajectory, namely:

3.1 Collaborative research partnership

3.2 Critical review of course designs

3.3 A set of evidence-based curriculum development and delivery guidelines

3.4 Explanatory conceptual model of online teaching-learning interactions and knowledge construction

3.5 Scholarly outputs

3. ANALYSIS OF DEHUB PROJECT'S OUTCOMES

3.1 Collaborative research partnership

The DEHub Project research proposal (2011) expressed the “will to achieve” a *collaborative research partnership* between CQU and USQ. The research and teaching relationships formed during this collaborative Project was expected to lead to further opportunities for research-based knowledge production in this field. In their effort to establish and build a collaborative research partnership as such, the members of this DEHub project benefited from the intellectual diversity within the team. Meanwhile, the team members, especially the project leader, gained valuable leadership experiences and skills in the process of confronting challenges including: creativity of divergent views, cross-organizational restraints, research ethics, clarifying roles for team members, updating project progress, and time management. Through participating in this DEHub project, the team members embarked on a journey of intellectual engagement with each other, activating a collaborative learning community.

3.1.1 Intellectual diversity

Managing a team-based research project that runs across two universities requires a commitment to learning by all members, and especially team leaders. A project team which is multidisciplinary presents project members and leaders with *a fortunate collision* of intellectual diversity:

“The DEHub project team is of a multidisciplinary nature with intellectual diversity. It is *a fortunate collision* of IT skills and education knowledge – collectives of people having strong IT and education knowledge merging their skills. For the Education Development Unit to have strong IT skills is fortifying as IT skills are really handy for education.”

3.1.2 Creativity of divergent views

Project leadership requires attention to managing different views – *creative and destructive tensions* – among team members to capture what is illuminating and valuable. This means

dealing with critique, counter-argument and counter-evidence in ways that are not reduced to ad hominem attacks:

“There are *tensions* – the process is both *creative and destructive*. This Project’s strength lies in emerging from a strong literature review which defines the field and its limitations. However, there are differences within the team; members have different views regarding the relationships between principles, models and issues. To date the process has just been a *de facto* stance of ‘agreeing to disagree’. Project leaders need to have dispositions to engage with rational disagreements. This is necessary, if all team members are to ‘buy into’ the Project. Leadership must move on from an individualistic approach to one’s own studies to re-conceptualize this Project as team-based.”

3.1.3 Cross-organisational constraints

While research teams from different universities may agree to collaborate, it does not follow that this agreement applies across the organizations:

“This has something to do with the misunderstanding of education and the ways organizations are structured. The reductionist model of organization puts people in silos and then tries to make cross-organizational connections. With analytics there is order at the macro level – the linear relationship between modal efforts and grades, complex adaptive system disorder at the micro level and order at the macro level, the way you make interventions at the level of students’ needs – need a range of solutions that change over time, by responding to and probing education complex adaptive system. Business intelligence units are really good at analytics, producing strategies for administrators and governance, showing program strategic data, not tactical data in time of need for academics – giving the other ranks to do their jobs.”

The demands of university administration for a project are central issues to be addressed by project leaders. One of the challenges of the DEHub Project was “the amount of administration; it is eye-opening how much of that there is.” This DEHub Project benefitted from the generosity and goodwill on the part of team members:

“Besides the complexity between sharing data between institutions, the collaboration between certain members of the Project team or the two Universities has been excellent. Once we had the necessary permissions, the interactions were excellent. It would have been nice to share the ‘at risk’ data.”

Ownership of data proved problematic:

“There is also the ownership of information or extracted data – IT is a separate division to access the data within the university, let alone across universities. This leads to issues of legality of sharing USQ and CQU data.”

3.1.4 Research ethics

Issues of research ethics have to be carefully considered:

“One example is the ways in which the monitoring of students and the investigation of the classroom are conducted. The **ethical** aspects of such close investigation of students are open to questions. If we were subject to the same sort of scrutiny into classroom we would object to it.”

3.1.5 Clarifying roles for team members

Project members and leaders need to negotiate **clearly defined roles**, and frequently review and revise these as the study proceeds:

“The Project’s team members need to have *clearly defined roles*. Team members have volunteered for this Project, but all have different perceptions about the Project and their own role. It would have been good for the Project leaders to mobilize the steering committees, and to use them productively in a way to throw light on the Project for the team. This is the role of the chief Project investigators. The busy people on the steering committee are not going to knock on their door. It is very complex. If nothing is written down, and there is little discussion of what the Project entails.”

3.1.6 Updating project progress

Ensuring that team members know where the Project is up to and what they are meant to be doing are essential leadership considerations to be **done forensically**. During the interim evaluation, one of the team members said:

“I have no sense of where we are at since the preparation of the proposal. That is the last full document with which we engaged. I was not clear as to whether there was any updating of the literature, and whether that review was *done forensically*. Strangely, updating the literature is being done by

employing two outsiders. Given the timeline, I now feel confident that we might have up-to-date material for chapter 2 literature.”

Leadership strategies are necessary to forming a team that has a shared focus, and for keeping team members on-task and up-to-date:

“Some team members are running to catch up with where the Project is supposed to be. It can’t be assumed that they all have the same starting point. There is a need to think about what strategies that could be used to bring team members up to speed, such as to sharing and discussing readings key to the Project. We are not as far along as we should be.”

3.1.7 Time management

Time management, and the work intensification produced by this study is a key issue for project leadership:

“There are organizational challenges such as the amount of time allocated to do this Project, which is zero. While I have a 20% research workload, I don’t actually get the time. Time is a major challenge in the Project.”

Team-based research requires project management skills to coordinate timelines.

During the interim evaluation, one of the team members said:

“To analyse three courses has been challenging because it has been difficult to coordinate with timelines. Project managing can be achieved by three monthly reports regarding what is going on at the same time. We have only analysed learner interactions. We were supposed to be trying to analyse three dimensions across three courses across the two institutions and come up with the model(s) - to have a conceptual view about the different types of interactions. Project management is a process of keeping the timeline and the process of getting to the interpretation and recording. Conceptual analysis and understanding is a leadership challenge, but in necessary in order to make it clear to others, and to enable exchange of ideas and interpretations. It is a challenge to have to make conceptual determinations and have it all written. The time-frame is tight for all the tasks. I anticipated more time for conceptual thinking and modelling, but I feel that we had spent more time doing project management tasks. This is a very time-consuming task. Get money allocation for marking, we need to use time more intensely. We can’t just do a little bit a day.”

3.1.8 Collaborative learning community

This DEHub research project provided ample opportunities for proactive learning.

“Active intellectual engagement is where one takes ownership of one’s own learning, engaging in ‘take and give’, having to think about why. Actively engaging as a learning community – interacting with content, having to think about it apply your knowledge, respond to others informed comments, individual reflection on one’s own experiences, articulating that, questions and challenges come back to reflection, collective reflection sharing experiences and literature ... self-awareness and awareness of others as part of transformational learning – being able to see one’s self through other people, seeing other people reflecting back to themselves.”

3.1.9 Collaborative research partnership: Comparative analysis of outcomes

The third stage of analysis involved a comparative evaluation of the interim and final project outcomes. Table 3.1 shows a summary of evidence of progress, interim and final evaluation results. It can be seen from the table that while a cross-institutional team of six researchers was formed prior to the beginning of the project, major progress in terms of developing and managing research partnership issues was achieved after the interim evaluation. Up until the interim evaluation, the team members had to deal with a range of problems concerning the collaborative research partnership. Not all the problems were resolved by the end of the project; however, the team members have achieved some valuable outcomes.

Table 3.1 Collaborative research partnership: Progress against projected outcome

Interim evaluation	Final evaluation
<ol style="list-style-type: none">1. Project Tasks, Timelines and Responsibilities provided an overview of the positive evolution of the collaborative research partnership between CQU and USQ.2. Evidence in this area focuses largely on matters of administration, less so on collaborative research project management.3. The major lessons learnt are concerned with project management issues, especially team-building, communication and protocols for scholarly argumentation.4. Research collaboration involves considerable online file sharing5. Technological problems were addressed e.g. P20. ARCS Data Fabric, DropBox, GoogleDocs6. Team member workloads, contracts and project budgeting were attended to.7. Ethics approval and confidentiality agreements are in place.8. External evaluation was approved for the project.	<ol style="list-style-type: none">1. Six researchers across CQU and USQ lived a process of forming and managing a research partnership.2. Cross-institutional project team videoconferencing and face-to-face meeting generated notes and actions from all project team members.3. The project report writing process especially chapter 3-6, engages multiple perspectives and collaborative analysis.4. The partnership developed certain understandings of issues including: creativity of divergent views; cross-organizational restraints; research ethics; clarifying roles for team members; updating project progress; time management.

3.1.10 Meta-analysis of learning journey

This is a learning journey where the team members have engaged in a process of arguing around alternatives, shifting perspectives, refining the research methods and conceptual models. Epistemologically, scholarly argumentation and rational disagreement are methodological techniques central to any research project. Research can be defined as the production of an informed, thoughtful argument that: (a) advances novel, insightful propositions using etic and/or emic concepts; (b) provides analyses of evidence and counter-evidence in relation to these propositions and counter-arguments, and (c) provides explanations and justifications for the connection between the proposition and the evidence and counter-evidence (Duschl & Osborne, 2002). In other words, the exhausting, intellectually engaging work of research choreographs arguments and rational disagreements which are constructed through the collection and analysis of evidence and counter-evidence to generate original knowledge that explains and justifies claims about complex educational phenomenon. This defines research as the use of argumentative logic with respect to:

1. a claim/proposition or series of propositions;
2. evidence or grounds to support the proposition;
3. a warrant validating the connection between the proposition and its grounds;
4. and some sort of backing that provides an agreed set of values, parameters, and common discourses as a foundation for argument.
5. It may also contain a rebuttal in opposition to the proposition and/or to its connection with the evidence.
6. The rebuttal could bring about a qualification of the argument. (Andrews, 2010: 216, numbers added)

Methodologically, argumentation is integral to the rational production of research-based knowledge. That reflexivity, critical reasoning and rational disagreement are crucial to the conduct of research means it deserves a central place in research project management. For instance, involving high school students' in the explicit consideration of argumentative reasoning improves the quality of their research practices and knowledge (Osborne, Erduran & Simon, 2004; Zohar & Nemet, 2001). Further, Kuhn and Udell (2003) established that peer dialogues involving arguments and counterarguments are effective in developing the argumentative capabilities of academically 'at-risk' 13- to 14-year-olds. Andrews (2010) also argues for the modes employed in making written and verbal scholarly arguments to be made explicit at universities. However, the analyses of written research reports indicate that they do not explain the attributes of arguments or how scholars constructed their arguments as part of the research process (Weinberger & Fischer, 2006). Disagreements in research teams are not a sign of a project's failure or team members' ill will or irrationality:

“Even though they understand one another perfectly, rational people may continue to be rational though they continue indefinitely to disagree; neither their mutual understanding nor their rationality is sufficient to achieve that consensus which is a necessary-condition of collective autonomy. Because of this, another ideal besides autonomy, one which recognizes the existence and the defensibility of rational disagreement, needs to be invoked” (Fay, 1987, p. 190).

3.2 Critical review of course designs

The DEHub Project proposal expressed the “will to achieve” a *critical review of course designs* that are both conducive to and effective for teaching and learning in online university courses.

3.2.1 Mixed-method approach

This DEHub Project set out to value and give value to combining quantitative and qualitative data analyses procedures which were conducted in parallel:

“We tried to strike a balance between quantitative and qualitative methods. There is a need to maximize quantitative data to find those patterns and to make analytical predictions. This involves dealing with large courses. Of course, you can only make sense students’ engagement through rudimentary IT mechanism. Teachers are essentially blind to how the students react or respond in online courses. In face-to-face classes, teachers can respond to the class; they can speak up to engage students, yet they don’t have the same capacity to do that online. What technological substitutes are available to see what happens and who does what in the online classroom? Every university is collecting this information and analysing the data retrospectively, but nothing is done at the academic point of need.”

Learning analytics provides a means of observing processes of on-line learning in model development:

“Our job is to describe what we have seen happening in these courses. To see what processes are going on so we can influence those processes, so often in online courses, we can sit back and take stock of what happens and see what you can do.”

As is known every research method has its limitations, these were fully acknowledged with respect to learning analytics in the interviews and are clearly stated in the report:

“The limitations of analytics is that numbers can only tell that much. The beauty of this project is it matches up quantitative analysis with qualitative analysis. You can have a number of hits, but at the same time delve into what the students can do. We use scripts to convert raw modal data into aggregated ones so that you can see the numbers of hits.

An interactive analysis of qualitative and quantitative data was necessary to reduce, but not necessarily overcome the limitations of one form of data collection against another, not in the least because of the focus – and thus the limitations of the data analysis procedures:

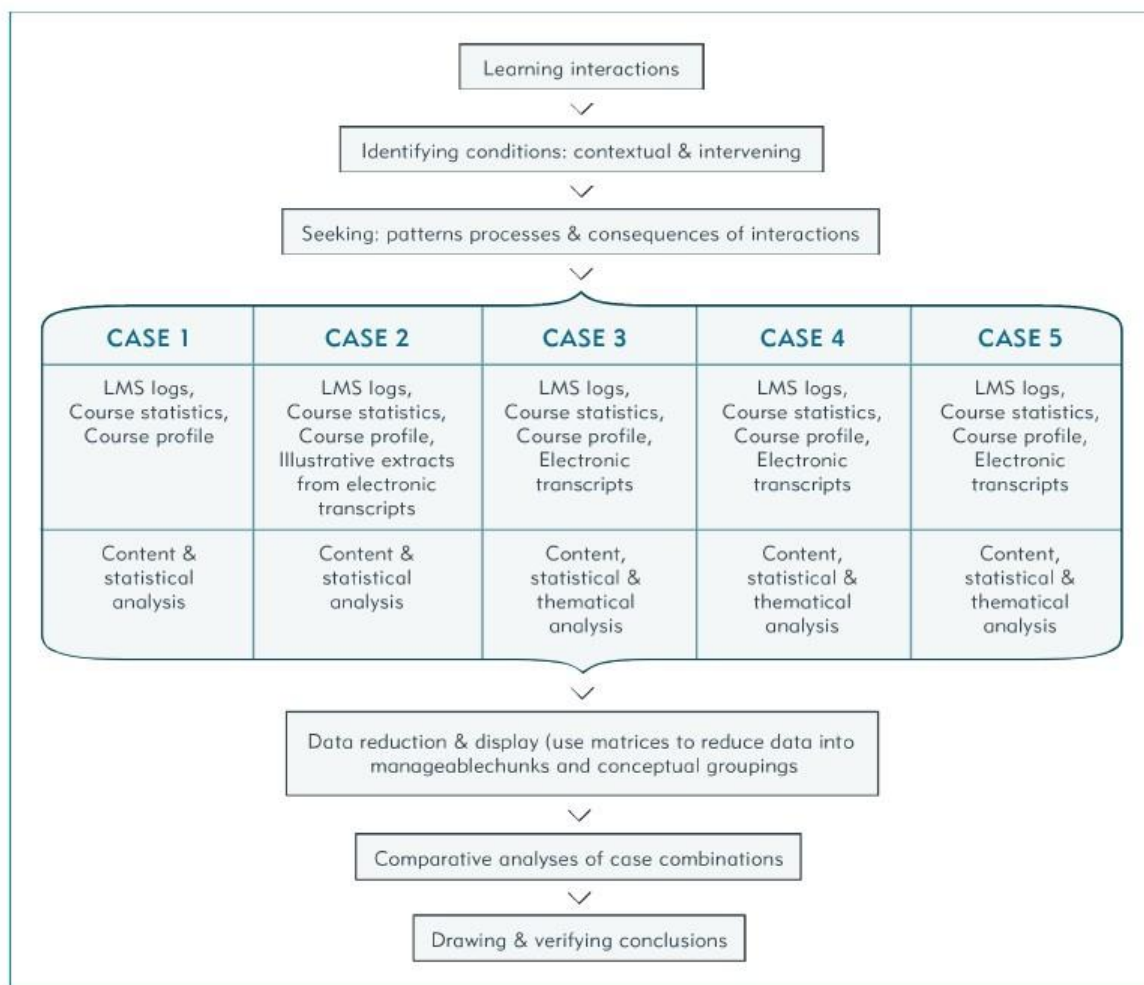
“Once we have the evidence from quantitative data this will provide new insights-limitations in the data and what interpretations can be made of that data. Contextualizing the online conversation is difficult and time consuming and out of sync. A response might be a post, a post might be a response. Again there is the issue of relationship between qualitative and quantitative data.”

Figure 3.3 (see below) is from the final project report. It is included here to illustrate the mixed-method approach of cross-case studies developed in this project. This important contribution that the DEHub Project had made can be explored on two levels: first, it values and gives value to integrating qualitative and quantitative data analyses, supplementing statistical analysis of student attributes and LMS learning hits through learning analytics with qualitative data analysis exploring in-depth factors, processes and consequences of online interactions. Second, as part of the qualitative data analysis, thematic analysis was used in case 3-5 but not in case 1 and 2, thus creating a comparative angle which enables the uses of “thematic analysis” in online education research to be re-examined. The “equal” importance attached to qualitative and quantitative data in cases 3, 4 and 5 highlighted the insufficiency of analytics as a research method of online education, as shown through the analysis of cases 1 and 2. However, there is a need to develop strategies to integrate analytics and qualitative analyses in a more meaningful way to highlight the significance of analytics, especially variables like age, gender and grade.

3.2.2 Model-testing research

In the beginning of the project, a model-testing approach could be perceived from the selection of courses for critical review. Courses for critical review were selected to validate the model.

“I chose CQU courses which can give justification for the model. To see what is happening in these courses provides some validation for the PhD model - its applications and relevance. There is some bias due to different understandings of the model, but we can understand and stand back to allow for differences and changes in perspectives.”



**Figure 3.3: A mixed-method Case Study Schemata
(Adapted from Rosenberg & Yates, 2007)**

Source: Figure 3.3 A Mixed Method Case Study Schemata (DEHub Final Report 2012, p.25)

Testing the model was central to the critical review of the courses

“We are looking at the multiple applications of this model for a range of courses at both the undergraduate and postgraduate levels. The project is investigating three different kinds of interactions across institutions. This could be used for other purposes as well. There is not any literature that looks at these three things in detail.”

This approach was challenged by the various sources of evidence generated by team members during the process of developing even more innovative and relevant conceptual models for this project (See section 3.3).

3.2.3 Critical review of course designs: Comparative analysis of outcomes

Much of the critical review of the course design was undertaken between the interim evaluation and the final report writing. Course design and structure were categorized as an intervening condition for the interactions which determine how online learning takes place and with what consequences (DEHub Final Report, 2012). Specifically, *synopsis*, *learning objectives*, *learning activities* and *assessment* of each course were examined.

The major finding regarding the critical review of course design shows that the learner-content interactions was the most prevalent form of interactions in all five courses studied in this project. Learner-content interactions range from 39% to 78% across the five cases with one case having a reasonably even distribution between learner-teacher, learner-learner and learner-content interactions. This might suggest that an emphasis on content creation and learner-content interactions should be given a major focus in online higher education. However, the interactions with teachers and other learners are considered by the literature cited in the report to be important to quality teaching and learning. Therefore, the DEHub final report (2012) argues that there is an inappropriate amount of significance given to curricular content development and learner-content interactions in online education in these cases.

Table 3.2 Critical review of course designs: Progress against projected outcome

Interim Evaluation	Final Evaluation
<ol style="list-style-type: none">1. A critical review of course designs was undertaken, with findings from two USQ courses provided: JOUR19024, EDG3001 and EDU5112.2. This critical review does not specify the target number of courses to be reviewed.3. It is not clear as to the explicit criteria that have been used to judge which online university courses are conducive to and effective for teaching and learning, and which are not.4. The report contains evidence for progress in this aspect. However, there are inconsistencies. Page 5 indicates that five courses have been “analysed to date”. The findings in Appendix 1 include analysis of three courses: two USQ courses and one CQU course.5. 10 references (among 33) listed in the reference list are not cited in the literature review.	<ol style="list-style-type: none">1. Course design in which participation was a major element was categorised as intervening conditions within this study.2. The “most pertinent finding to the teaching academic” is “the misplaced emphasis on content creation and learner-content interaction in course design” (DEHub Final Report, p.134).

3.2.4 Meta-analysis of information, communication and surveillance technological systems

Key elements of this DEHub Project might usefully inform and thereby improve online learning and teaching. However, this would mean connecting learning analytics resources with course leaders, so that they can work with academics who interact with students and adapt the courses. Typically, it is academics who are responsible for the design and delivery using information, communication and surveillance technologies (ICST) systems; although the surveillance uses of the technology is a matter for university management. Learning analytics information grounded in specific courses can provide academics and students with evidence to use in the complexities of their educational decision-making. Academic and students interactions via web-based learning environments are among the many factors in the scholarly arguments and managerial press to improve learning and teaching. Their teaching/learning decisions are based upon and evolve, unpredictably in relation to this evidence, their interactions and adaptability, along with other complex drivers of teaching and learning. However, the danger for distance education research is that the current mode of organizational management, is the construction of universal constants or generic indicators that can be used to regulate and micro-manage teaching and learning through ICSTs. The report (2012) presents a selected excerpt of a student stating: “I do not post personal information to forums and will not be posting a picture or other personal details.” However, the university has details of this students’ age, gender, grades versus hits, as well as interactions with other learners, teachers and content – and much else besides. It is not clear what uses can or cannot be made of these personal details by universities, it is not clear that by engaging in online learning that students who do not want to post personal information online are necessarily doing so.

It is folly to think that university managers, academics and students, all being competent rational users of ICST systems must agree on the particularity of their uses, or the one ‘best’ theory or model. Analysis may confine or enable them to rationally adopt different uses, models or theories. However, one does not decisively and absolutely determine the other. Neither the research process employed by the DEHub Project can dictate a single answer to the problems under investigation, nor can its report dictate a single answer as to how it results can or will be used:

“To identify rationality with certainty or proof or with single solutions is already to accept a construal of the relationship between humans and their world which underplays its ineradicable complexities, ambiguities, and uncertainties” (Fay, 1987, p. 179).

Research does not require or presuppose that all those involved in the inquiry process or all those who use the research report will necessarily agree with one another. To undertake educational research means developing good reasons for various propositions based on sound evidence and insightful concepts:

“together with an openness to reconsider alternatives and a willingness to revise one's beliefs if evidence is adduced which fits better with an alternative system of belief. To be rational is to be informed about the relevant facts, clear-headed conceptually, impartial, open-minded, consistent, and accountable to the evidence as responsibly as one can; or rather, it is to be all of these things at once. It is true that a group of people who possess these characteristics would not necessarily agree with one another; but this does not show that their beliefs are not rationally based, or that they are not rational creatures. Rational beings can disagree with one another and still be rational as long as they are willing to submit their beliefs to argument and debate, as long as their adherence to their beliefs is consistent with the evidence as they best know it, and as long as they are on the look-out for other beliefs which square better with the evidence. ... Rational people are those who are uncertain of the truth of their beliefs, and who are thus open to revising them if the evidence warrants it” (Fay, 1987, p. 179).

3.3 Explanatory conceptual model of online teaching-learning interactions and knowledge construction

The DEHub Project proposal expressed the “will to achieve” a *conceptual model* to illustrate and explain the role of teaching-learning relationships in online interactions and knowledge construction in university courses. It expressed the “will to achieve” a model that would explain the relationship among course design, academic, students and content interactions, and student learning in online courses. Further, it was also projected that this model would detail the patterns, processes and consequences of these different types of interactions in online teaching/learning contexts.

3.1 Team-based model development

Leadership is necessary to build a team, and to inform and form their collective recognition of the Project's potential benefit and impact:

"What is the use of this Project for academics in higher education? What is it meant to transform? How is it meant to impact upon academics and students? For whom is this Project meant to be a benefit? Is it for academics who are interested in redesigning their courses? Is it to inform students? Is it to tell them what it is like to be 'on-line students'? Is it to provide university management with findings to consider how to run online programs? It is not clear to all the colleagues in the Project team what the impact of our work is meant to have or might be. Team-based projects are different from doing a project by one's self".

Together the team had to address various issues regarding the model development:

"We have 3 months left. I do *learning while writing*. It is slow to put it together. I find it hard to articulate my understandings so as to negotiate with others. We can't go too deep, because the work will be cut out. The need is to write up the case description as the basis for the models. We have a model. We have to look at the courses and flesh out the model, and document the model in relation to the courses. The principles will emerge from bringing the model and the course descriptions together. Get feel for the model. What comes first, the model, the evidence, or the principles? For whom is the model being developed?"

3.3.2 Opening up models of conceptualization

These key questions were answered in various ways. For some the model should come from the evidence. The initial model-testing approach of model development was challenged.

"It is worth considering to develop a model rather than starting with one, with the latter risking constraining the project. How much is a pre-existing model a prison house?"

A grounded theory method could be used for model generation:

"The spirit of the methodology is open versus closed. If it is prescriptive, how much does this constrain the project? Are there other ways of doing this? What other factors from the universities act on, constrain and enable online

interactions? There is a need for a wider range of data about what university factors have a bearing on this project.”

A self-critical disposition is seen to be a defining attribute of leading-edge researchers:

“There has to be a **disposition of researchers** to be researching and questioning their own practices, to see one’s last project as a beginning and not an end. It is like having a license for a teacher to drive. Isn’t it that disposition that enables you to develop yourself as a researcher in the field of education? Some like being challenged to learn – a disposition that leads us to enjoy the work and enjoy the challenges. While some prefer closed thinking, good researchers engage in lateral, reflexive thinking.”

Team members were of the view that “it would be fantastic to have this model in two similar universities, which have complex online learning systems”. However, there were managerial barriers to applying the model:

“There are organizational impediments to putting that into practice, like learning and teaching plans, and strategic plans. If the model does not get through, there might be a need to follow up this project to investigate the implementation of this model in the context of organizational drivers.”

It is not evident that the model deals with challenging organizational culture to encourage diversity:

“Educational development unit needs a higher-level perspective at program level which is different from course level. It needs a complex adaptive system that encourages diversity- to involve people from diverse background and experiences as much as possible so that it is possible to get a variety of opinions and more disparate thinking. This will lead to better results than simply getting people with the same background, ideas and cultures. Otherwise, you get very narrow, less robust products. This is one of the challenges of how to make a series of divert interventions within organizational culture and structure. You have to take baby steps.”

However, challenging organizational culture is an evolutionary, iterative process:

“Tensions between complex adaptive systems – it is an evolution not a revolution, to make sense by probing for responses in an iterative process. Don’t do it on one facet, like the military/machine model of university organization. Academics throw rocks at you if you do this. Evolutionary systems make small changes that do the work for them, not to make them do a big arduous job. Instead, pull existing information; make it easy for them to reduce the cost of learning. *Apple* makes it so easy for you to give them

money. They make it a painless process – that is their business model. Why do universities not pick up on these? Evolution is still in the early stage of technology assisted learning. It is at a point where most of the senior managers are older. People have not moved into these positions.”

There is a need to develop different on-line learning models for different academic levels in universities: “There could be different models – depends on assessment, postgraduate and undergraduate levels”.

This means customizing the development of on-line learning models:

“The images stay the same, but different courses may have different consequences, and intervening conditions which then generates a customized model, can cut in between conditions and intervening conditions, can intersect at different points of actions between the different factors in the model in different contexts, can look at different points to make a difference in students learning. Where does it differ? It is an extension – by learner-learner interaction to teacher and content. I was getting a sense of these while doing PhD ... consequences key interactions, because of the courses, difficult to differentiate between learning and content in this process.”

An on-line learning model needs to capture the dynamic interactions between concepts:

“If model arrows between relations show that interactions of relations can be effected by the points of the arrow to effect learning, in order to engender a sense of community, we need to measure learners engagement with learner, to have learners engage with content, their learning is improved with the learner together, if you want to provide a community then you need to do this – the principles are derived from the interactions about the concepts.”

Further, an on-line learning model needs to draw boundaries with respect to teacher-student interactions:

“Sick and tired after asking for extension, setting a climate where no extension will be given, establish conditions, which influence actions and interactions, set the tone, draw the boundaries.”

While management loves analytics maybe this project could help

“steer them in the way to assist academics. US/Canada analytics is to replace the academic, versus supplementing it. Is this a material agenda in Australian

universities? Not in Australia. Management has a ‘cookie cutter’ approach like putting into silos, but learning and teaching is complex and messy, not the neat ordered models managers like to have.”

Experience in this area suggests that the interests of university managers are central:

“The massive hierarchy in university is surprising – they have all these metrics. There was no support, one had to improvise. There was no such a thing as not being able to fix it. We had a good leader at university, very abstract thinker, open-minded to different possibilities. The crisis of universities occurs when you don’t understand if they are businesses or universities. Businesses are about making money while universities are about producing good learning and teaching. The nature of short-term management is they come in for five years and make changes that look good over the five years. It is a very short-term approach, a teleological approach. People can manage from the top. The balance between management and leadership in universities is out of kilter.”

3.3.3 Conceptual modelling: Comparative analysis of outcomes

Two different types of conceptual models have been developed at different stages of project conceptualisation. Table 3.3 shows a summary of evidence of progress, interim and final evaluation results. Appendix A in the DEHub Final Report (2012, p142-151) illustrates the online learner-learner, learner-content and learner-teacher interactions respectively in case 3, 4 and 5:

“The diagrams depict the categories and subcategories associated with each of the three interaction types as a unit of analysis within each case. The range of properties and dimensions are identified to facilitate an understanding of each category and to show how they are linked. Green association lines are used to illustrate further connections between categories and subcategories” (DEHub Final Report, 2012, p.142)”.

The neural-networking diagrams mapped the categories and sub-categories involved in the interaction types. The online interactions vary within and across each case. A holistic interpretation is provided by the dirigible model of online interactions.

Table 3.3 Conceptual modelling: Progress against projected outcome

<i>Interim evaluation</i>	<i>Final evaluation</i>
<ol style="list-style-type: none"> 1. This conceptual model is supposed to be extending Rossi's (2010: 234) schematic model of "elements of online learning." However it is not clear even what this schematic model is. 2. Developing the model is the target outcome of the research project listed in the conclusion of the research article submitted to the <i>DEHub Quarterly</i>. However, little evidence shows that work on constructing the conceptual model, a core project outcome, has begun. 	<ol style="list-style-type: none"> 1. The neural-network models mapped the complex issues of teaching-learning relationships involved in online interactions. 2. A dirigible model offered a holistic illustration of online interactions through LMSs.

An etic concept of "dirigibles" is used to conceptualise the LMSs as a learning platform.

"In the twenty-first century, LMSs are the dirigibles of online education. Like the airships of a century ago, they are known for their skeletal rigidity, impermeable membranes filled with volatile gaseous variability of knowledge constructions, yet with gondola windows that enable passengers to connect to other worldly knowledges, while tethered to institutionalised entrance and egress points" (DEHub Final Report, 2012).

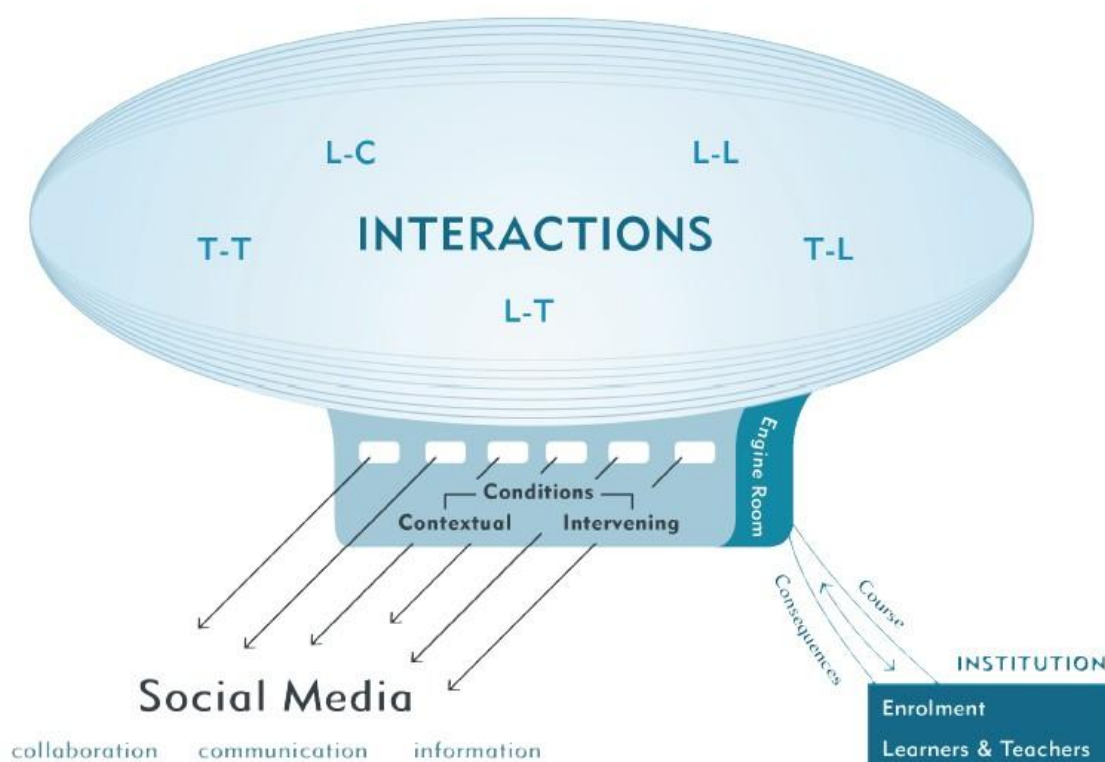


Figure 6.1: The LMS – internal & external learning interactions

Source: Figure 6.1: The LMS–internal & external learning interactions (DEHub, 2012, p.137)

This metaphor represented a panoramic understanding of online interaction gained through the data analysis in this DEHub project. The use of this metaphor in the DEHub Report involves the use of images and concepts through which readers are invited to visualize or to picture a process otherwise very difficult to capture. The metaphor of “dirigibles” has been organized into a systematic model that provides a clear and intricate series of categories (Turner, 2010). This model offers novel concepts of “skeletal rigidity”, “impermeable membranes”, “volatile gaseous variability”, “gondola windows”, “institutional tethering” and “institutionalised entrance and egress points”. While the power of LMSs is much celebrated in the education field, their potentials need to be further explored to combat the abovementioned restraints. Geertz provides a definition of metaphor relevant to the purposes of educational research:

“a metaphor is a way of talking that works well in one field of inquiry and that is employed in an attempt to make sense of something in another field of inquiry; we resort to metaphor when we seek to make sense of something which is not comprehended by means of something which is comprehended better, but comprehended somewhere else” (Geertz, 1983 cited in Turner, 2010, p. 81).

The use of the “dirigible” in Figure 6.1 is more than a replacement of words with an image (Turner, 2010). It persuades us to think of the online learning environment in terms of the constructed implications associated with old-time airships. What is significant is that it gives us something to view mentally, something more familiar and tangible but filled with loaded suggestions for theorizing.

3.3.4 Meta-analysis of etic and emic theorising

Theorisation is important for analysing patterns, conceptualising relations without dissolving complexity, and producing novel imaginings. Emic and etic approaches to data analysis and its theorisation are used in a range of fields for these purposes, including in nursing (Hoare, Buetow, Mills & Francis, 2012). Etic analysis consists of observing and reporting of a particular phenomenon with theorising conducted without reference to any of the concepts of those within the group being studied. An etic analysis applies generic categories or constructs, derived from an external theoretical source to discuss observed practices. Few, if

any of the concepts or metaphors used in the analysis or associated conceptual mapping are derived from the original data that has been generated. Etic analyses afford an external theoretical perspective, with the theoretical tools of interpretations being imposed coming from beyond the evidence involved. This is the approach used to generate the concept map or model used in this study. The modelling done for this project resembles an examination of general traits, fitting selections from the available data to the generic attributes.

The report notes that the theorisation of the phenomenon it addresses is in its infancy. A key issue for etic analysis and theorisation concerns selection of source for the theoretical tools used in the analysis. Generative, innovative, cutting-edge research tends to be based on combining a focus on leading-edge debates over the concepts constructs mobilised within a given field, and the introduction of new theoretical tools from outside the field, to provide the level of critique (creative, critical thinking) needed to prevent debates – thinking and action – within the field from becoming rigid, inflexible, and thus moribund. For instance, theorists of cultural acceleration (Redhead, 2004) offer etic concepts for exploring online learning in terms of questions concerning what technology is, technologies of disappearance and uncritical conceptions of technology. Etic concepts derived from such theories open up to question how cultural acceleration, the speeding up of education, challenge many assumptions about what is the ‘learning’ and ‘teaching’ that is taking place, as much as the web of managerial surveillance of teachers and learners. In resisting social constructivism as a basis for the critique of the world-changing experiences produced by GRIN techno-scientific knowledge-cultures, cyberculture theorists (Bell, 2007) examine the interplay of concepts in a way that could usefully help blur boundaries otherwise treated as distinct, thereby pointing to hazards while opening up new theoretic-practical framings of online content-learning-interactions-teaching.

Evidence-based health care now argues for the integration of both emic and etic modes of analysis (Hoare, Buetow, Mills & Francis, 2012). Emic analysis portrays features of a particular phenomenon from the inside, and takes the insider’s conceptions as a serious source of theorising. This would generate an alternative conceptual map that provides a contrasting perspective on the phenomenon under study. This provides a representation of the richness and complexity of the phenomenon, and avoids the reductionism that comes

with cutting excerpts and pasting them into pre-determined categories. In this project an emic analysis on online interactions might have revealed various other features of this particular phenomenon, such as utilitarian, hedonic and social dimensions. Examples of emic categories given in the report that could provide teachers, students and management different, less abstract and therefore qualitatively richer insights into online teaching/learning include: 'uppers,' 'inconsiderate listener', 'minor hiccups,' 'ladies,' 'small group bonding,' 'poor feelings,' 'it is a struggle' and culturally ambiguous terms such as 'group norms.' However, as the report notes, the theorisation of the issues raised in this report is in its infancy. A key idea borne out in the DEHub Project is the underdetermination of any particular theory or model. Theories, models, concepts and metaphors are structures which try to make sense of a large amount of data by fitting what is thought to be the situation into a rational outline. The point borne out by the DEHub project is

“that there is no reason to expect that there will only be one way to organize this material into such a pattern. Instead, there may be a number of competing theories equally sustained by the evidence such that there will be no rational compulsion to decide in favor of one theory as opposed to another. This, of course, does not mean that theories are not responsive to evidence; they are, on this view, logically constrained by it, but they are not determined by it. In other words, to be acceptable, theories must be consistent with the evidence as it is known, but they are neither uniquely derived from statements of evidence alone, nor can they be uniquely refuted by them. Hence, no theory is uniquely acceptable” (Fay, 1987, pp. 177-178).

3.4 A set of evidence-based curriculum development and delivery guidelines

The DEHub Project proposal expressed the “will to achieve” a *set of evidence-based curriculum development and delivery guidelines* that will enhance online teaching-learning relationships in online university courses. These guidelines were to be developed from the forgoing model, and identify conditions conducive to these interactions and “effective learning” in online courses. It was expected that the model and guidelines might be used by the partner universities to enhance the design of online courses, the learning and teaching experience of students and academics, and the learning outcomes of online, distance education.

3.4.1 Teacher's role in learner-teacher interactions

During the interim evaluation, one of the team members observed: "The determination of our research project intervention is not yet clear; I am not definite about what it is all about." With regard to the teacher's role in learner-teacher interactive discussions a team member asked:

"Do the teachers analyse their own role in the discussion? What types of questions get feedback from students? What they do or do not understand, do or do not arise as issues in the class?"

The students' passivity is overwhelming, especially in large courses: "People are so passive, can't get discussions going, or on the other hand it is so overwhelming with 600 students, one can't deal with that number." Having 600 students makes calls for active and interactive participation a challenge:

"Have to reflect on how five of their 'post' helped them to learn – more a constructionist view of learning, than a socio-constructivist view of learning – reflect on roles and take on responsibilities, being reflective, use each to reflect on their own professional experience."

Teachers are advised to consider the focus and frequency with which a student participates in an online discussion: "Have to get ready the focus or frequency of topic, students had to discuss or debate that topic, and they build on that." Moreover, teachers need to ensure that discussion of topics does not become fixated: "Discussion topics for each week (relating reading to students' experiences) need to do teaching and learning beyond the fixed." Teachers are advised to respond to all students, not to individuals: "Never respond to an individual, but to all the students." Teachers need to structure discussions:

"Discussion needs to be structured. They have a general social discussion, need to structure and focus the discussion – otherwise they turn it into moaning. Maybe create an arrival-lounge for students to introduce themselves; create activities outline about what you expect of the students; criteria related to the level of participation; get some students who don't fully engage, modelling in the course, respond with prompts, scaffolding – have a look at x's work, more detailed comprehensive response, and they can do further work."

3.4.2 Mediated interactions in writing

Mediated interactions in writing are important for education which is memory work:

“Vygostky’s concept of mediated interactions means speech has a function, speech is action; writing is recall. *Writing helps to remember* it, and requires thinking through articulation and social negotiation of meaning. You can learn more if you put in the effort, need investment, commitment and time.”

Students learning interactions on-line are through writing

“Promoting reflection, scaffolding and engaging with each other, wanting to see argument and debates in writing ...the process is a good medium for learning if it gets them to write – documenting your knowledge and understanding and engaging with the views of others. Writing makes a more meaningful experience – forming a learning relationship through writing.”

Writing is important for learning as much as it is for assessment:

“Rules like “no merits for attendance, no merits for participation” but merits for ‘learning interaction’ to promote learning interaction. Setting up criteria for assessing; of course students who say nothing might also be learning, but here we need to go back to the issue of writing – learning through writing, making it clear and public through its written articulation – that makes a different, qualitative learning – your learning will be different if you engage in that kind of activity.”

Feedback is educationally important:

“A feedback loop to see what has happened (but is not part of the analysis) - to include in assessment items a reflective component – want to see what they are thinking – what does this mean for changing the teaching practice.”

3.4.3 A comparative analysis of interim and final project outcomes regarding curriculum development and delivery guidelines

A set of evidence-based curriculum development and delivery guidelines have been developed to inform future online course designs in terms of all three types of online interactions. Table 3.4 compared the interim and final evaluation results with regard to this outcome.

Table 3.4 Curriculum development and delivery guidelines: Progress against outcome

<i>Interim evaluation</i>	<i>Final evaluation</i>
1. Little evidence indicates the commencement of work towards this Core Project Outcome.	1. A set of evidence-based curriculum development and delivery guidelines have been developed.

3.4.4 Meta-analysis of creative research in distance education

The challenge posed by leading-edge research that makes a substantive contribution to the production of original knowledge is that the data is used to re-think existing theoretical presumptions, and existing, explicitly stated theoretical frameworks are reconstituted through the data. Jackson and Mazzei (2012: vi-vii) argue that

“qualitative data and analysis does not happen via mechanistic coding, reducing data to themes, and writing up transparent narratives that do little to critique the complexities of social life; such simplistic approaches preclude dense and multi-layered treatment of data. Furthermore, we challenge simplistic treatments of data and data analysis in qualitative research that, for example ... reduce complicated and conflicting voices and data to [etic] thematic ‘chunks’ that can be interpreted free of context and circumstances”.

Much leading-edge creative research in distance education using qualitative methods of data collection and analysis argues within and *against* mechanistic coding, data reduction and the theoretical pigeon-holing of evidentiary excerpts. Such closed, fixed modes of qualitative research do little to advance the critiques needed for thoughtful and informed innovations. They do even less to explore the complexities at stake in distance education. Closed, fixed modes of research preclude the multi-dimensional treatment of dense data sets. For Jackson and Mazzei (2012: vii) typical problems for such qualitative research include being seduced by the desire to create a coherence bound by themes and patterns, which in turn inhibits the inclusion of data beyond a priori theoretical fixity. In contrast, cutting-edge research pushes research, data and theory to their limits within the available timeframe in order to make a substantive contribution to the production of new knowledge. Acquiring the skills of a good educational researcher

“is not reducible to learning a set of rules which indicate what one is to do in various laboratory situations. It is, rather, acquiring the practical sense of knowing what appropriate research behavior is and knowing how to make

judgements which express this understanding in the myriad circumstances in which [educational researchers] might find themselves. The same is true for cooks, auto-mechanics, teachers, nurses, lawyers – indeed, for all those endeavors in which general rules act as guides for behavior but which themselves must be interpreted in order to be applied to particular circumstances” (Fay, 1987, p.181).

3.5 Scholarly outputs

The DEHub proposal expressed the “will to achieve” *scholarly outputs* over the project’s 18 month life-span by contributing positively to the research and publication quantum of both institutions and the DEHub consortium.

3.5.1 Identifying original contributions to knowledge

During the interim evaluation, one team member stated in terms of scholarly publication:

“I feel guilt-ridden and angst about not progressing with the proposal. Progress on this has been slow. We are not clear about what these publications will make a contribution to”.

The DEHub proposal also expressed the “will to achieve” the dissemination of the project’s results to enable the Australian and international higher education community to benefit.

In terms of drafting the project report, a team member asked:

“What is the constituency for the project report? This relates to publication. This relates to what contribution the project will make to the literature.

This project had value for the professional learning of the participants:

“I can see it benefiting my own teaching. The nitty-gritty knowledge is easier to gain through showing and telling, or demonstrations (the conditions and the intervening conditions for learning) – including face-to-face interactions, and interactions at a distance.”

3.5.2 Scholarly outputs: Comparative analysis

Table 3.5 indicates the progress that the DEHub research team members have made in producing scholarly outputs.

Table 3.5 Scholarly outputs: Progress against projected outcome

<i>Interim evaluation</i>	<i>Final evaluation</i>
1. One article submitted to <i>Journal of Learning Design</i> 2. One article submitted to the project-based <i>DEHub Quarterly</i> .	1. One paper in press. Four conference papers are in progress, to be presented in conferences in both Australia and other countries.

To date, the following scholarly outputs by the team members of the DEHub project are either in progress or in press.

- a. Barbera Gregori, E., Danaher, P. A., & Janse van Rensburg, H. M. (2012, September 18-21). The temporal dimension of open learning as educational freedom: Lessons from e-learning policies and practices in Spanish and Australian universities. (Paper to be presented at the annual European conference on educational research, University of Cadiz, Cadiz, Spain).
- b. Beer, C., Jones, D., & Clark, D. (2012), Analytics and complexity: Learning and leading for the future. (Paper to be presented at the annual ASCILITE 2012, Massey University, Wellington, New Zealand. 25th-28th November 2012).
- c. Danaher, P. A., Barbera Gregori, E., Clara, M., & Janse van Rensburg, H. M. (2012, September 27-28). Assuring quality and ensuring sustainability: Lesson for European higher education systems from Spanish and Australian open and flexible education provision. (Paper to be presented at the 25th annual conference of the European Association of Distance Teaching Universities, Open University of Cyprus, Paphos, Cyprus).
- d. Janse van Rensburg, H. M., Rossi, D. M., & Harreveld, R. E. (2012, April 27). The power and the passion of discourse: An analysis of learner-learner, learner-teacher and learner-content interactions in online learning contexts. (Paper presented at the 9th University of Southern Queensland Faculty of Education Postgraduate and Early Career Researcher Group research symposium, Faculty of Education, University of Southern Queensland, Toowoomba, Qld).
- e. Rossi, D. M., Janse van Rensburg, H. M., Harreveld, R. E., Beer, C., Clark, D., & Danaher, P. A. (2012, September, in press). Exploring a cross-institutional research collaboration and innovation: Deploying social software and Web 2.0 technologies to investigate online learning designs and interactions in two Australian universities. *The Journal of Learning Design*. 5(2).

3.5.3 Meta-analysis of research publication agenda

Designing research projects to contribute to the quantum of research publications of universities, and to the personal benefit of researchers themselves is driven by bibliometrics to measures of research productivity (Auranena & Nieminen, 2010; Canavan, Gillen & Shaw, 2009; Jarwal, Brion & King, 2009). The Australian Government's ERA has sanctioned the use of bibliometrics to measure research impact, measures which are used to support recruitment, promotions, grants and institutional comparisons (Drummond & Wartho, 2009; van Aalst, 2011). Part of the problem is that there is "no systematic process of measuring the broader economic, social and environmental benefits of publicly funded research undertaken across the publicly funded research system as a whole" (DIISR, 2011, p. 7). Even so, there is a need for distance education researchers to consider the benefits to academics and students themselves of large-scale publically funded research. Learning analytics, for instance, may contribute to improving students' learning and academics' teaching, if a vehicle is found by which they can be made of pedagogically relevant patterns in the data. Inter-university collaborations in distance education research provide an important focus for making improvements in students' learning and academics' teaching as primary research objectives – and as valued and valuable outcomes - of the research project itself. Moreover, there is a need to train a new generation of researchers who can conduct distance education research that directly contributes to improving students' learning (Lasley & others, 2006).

Future research publications might usefully appropriate the best of what the DEHub Project has achieved over the past twelve months. Individuals or groups from the team could constitute journal articles or chapters out of the history they have undertaken and make these accounts of their own original contributions to knowledge. In doing so, they are likely to transform themselves and the Project's outcomes in terms of the material provided in the DEHub Report. Individuals and groups within the team are just the creative elements which, among the Project's evidentiary archive and theoretical insights, can make useful conceptual resources for advancing significant scholarly arguments in this field. Of course, the team members need not treat the totality of the Project as worthy of further elaboration; they can reject any or all of it if they wish. Logically, it would be valuable to use the inheritance made available through this Project to press forward the innovative insights it has provided. This

means individuals and groups within the Project team need to be able to dissociate themselves from the Project as experienced, such that any and all parts of it can be rationally criticized and their imaginations inspired to document what truly are the most original contributions made by this Project. It is timely and appropriate for Professors Harreveld and Danaher to consider writing and publishing a multi-authored book based on the DEHub Project to disseminate original findings:

1. Digital higher education at our finger tips?
2. Building digital communities of practice into teaching and learning: Sustaining intellectual engagement among students and academics
3. Aligning institutional strategy for the use of learning analytics by academics in pedagogical innovations for improving teacher-learner and learner-learner interactions.
4. Developing cross-institutional partnership management to strategically and effectively embed digital tools and ensure authentic learning given organizational restraints, divergent views and ethical issues.
5. Using the 'dirigible' model to create mechanisms to support increased digital literacies amongst students and academics within the constraints and opportunities of the LMS systems.
6. Implementing appropriate governance frameworks that account for the contextual, intervening and interactive conditions for embedding online learning networks and course-based learning environments in program delivery.
7. Using learning analytics to measure the success of, and develop guidelines for curriculum delivery and learner interactions through mobile and social media.
8. The digital future of the academic workforce: Preparing for the changes
9. Embedding collaboration, scholarly argumentation and rational disagreement for changing models of course development, online learning networks and course-based learning environments
10. Developing and implementing high quality approaches to researching and evaluating digital higher education

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