The Learner's Learning Environment: Three Drivers that Impact on its Construction and Use

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ABSTRACT

With universities adopting a learner-centered, constructivist approach to learning and greater use of technology, combined with the pressures of 21st century living and the increasing number of people taking up tertiary study, there is a greater need than ever to determine how a learner constructs and uses his/her learning environment, and what drives that process of construction and use. This thesis investigates the learner's learning environment from the learner's perspective. Through the analysis of semi-structured interviews, and personality type as determined by the Myers-Briggs Type Indicator®, it identified three drivers that impact upon the construction and use of the learner's learning environment. These three drivers are: 1) the learner's impetus to learn; 2) the self-perceived technology ability of the learner; and 3) the personality type of the learner.

This thesis looks at the construction of the learner's learning environment as part of constructivist theory, recognizing that, as in the construction of new, individual representations of knowledge, each learner forms new, individual representations of his/her own learning environment, determined by the drivers that impact on this construction and use.

The thesis also examines the learner's learning environment in light of the provided environment for the unit of study they are enrolled in. It shows that pedagogical approaches, learning environment design and choice of elements included in the provided environment, may be at odds with the learner's drivers and the way in which they construct their learning environment. As a consequence, the educator cannot guarantee the learner will use the provided environment as intended or envisaged, which may impact on the learning outcomes for the learner. These findings therefore, provide insights into the ways in which a learner incorporates the provided environment into his/her own unique learning environment, offering practical information for the design and development of the provided environment.

D E C L A R A T I O N

This thesis contains no material which has been submitted for examination in any other course or accepted for the award of any other degree or diploma in any University, and to the best of my knowledge, contains no material previously published or written by any other persons except where due reference is made in the text.

Signed: [redacted]

Ainslie E. Ellis

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A C K N O W L E D G E M E N T S

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List of acronyms and abbreviations

A large number of acronyms and abbreviations, of necessity, have been used, and while their full expansion has been included where they have been used in the text, it was felt that a reference list of these terns could prove useful to the reader.

ASCILITE	Australasian Society for Computers in Learning in Tertiary Education
BSCW	Basic Support for Cooperative Work
C&IT	Communications and Information technology
CMC	Computer-mediated Communication
CSCL	Computer Supported Cooperative Learning
EFTSU	Effective Full Time Student Units
HERDSA	Higher Education Research and Development Society of Australasia
HTML	HyperText Markup Language
IT	Information Technology
LASSI	Learning And Study Strategies Inventory
LMS	Learning Management System
MBTI	Myers Briggs Type Inventory
Moodle	Modular Object-Oriented Dynamic Learning Environment
MSN	The Microsoft Network (Microsoft's portal)
MUSO	Monash University Studies Online
NASA	National Aeronautics and Space Administration
OLE	Online Learning Environments
OLES	Online Learning Environment Survey
PBL	Problem-based Learning
PDA	Personal Digital Assistant
PLATO	Programmed Logic for Automated Teaching Operations
PLE	Personal Learning Environment
SIAM	System for Interaction Analysis by Machine
SUNY	State University of New York
WebCT	Web Course Tools

1 Chapter One – Introduction

1.1 Introduction

There has been considerable work in the last decade and a half to develop appropriate learning designs and learning environments for the higher education sector (Conole, Oliver, Falconer, Littlejohn, & Harvey, 2007; D'Agustino, 2011; Information Resources Management Association, 2011; Oliver, Herrington, & Reeves, 2005). Learning environments and learning designs of today go well beyond the didactic face-to-face "chalk-and-talk" lecture and tutorial. Most units of study at tertiary level are supported by some form of Learning Management System, the use of educational technologies and pedagogies that are more learner-centered.

This change has seen the development of learning environments that provide the learner with a much greater level of control over his or her learning, and subsequently the learning environment. They provide more open-ended environments that enable social negotiation and engagement, opportunities for collaborative learning and the development of communities of practice (Conole et al., 2007; Wenger, 1998). The current web-based technologies are now enabling personalized learning environments to be developed that "adapt educational content, presentation, navigation support, and educational services so that they match the unique and specific needs, characteristics, and preferences of each learner or a community of learners" (Magoulas & Chen, 2006a, p. xi).

Learners are now required to take greater responsibility for their own learning, constructing their own learning environment to suit their own needs, learning style and learning strategies. They will take what is provided, using some aspects and discarding others, and will add their own features and adapt the systems to suit their needs.

1.2 Learning environments in the higher education system

Any study relating to learning environments requires the exploration of the various environments that exist within that education sector (i.e. the provided environment). While a fuller coverage of this aspect will be dealt with in Chapter Two as part of the

literature review, some description is needed that outlines the impact of changes that have occurred within the higher education system since the late 1980's that have affected its learning environment.

Prior to the reforms to Higher Education as outlined in the 1988 Dawkins' white paper entitled "Higher Education: A Policy Statement" (Dawkins, 1988), universities were, in the main, single campus autonomous institutions that provided a learning environment comprising face-to-face large group lecture theatre didactic presentations. These were supported by small group face-to-face tutorials or laboratory sessions utilizing more interactive pedagogy that allowed for further exposition and understanding, opportunities to ask questions, practice and skill development, experimentation, problem-solving and discussion. Such environments required the students to attend classes at set times and were quite separate from the learner's own environment, with both environments residing in separate physical spaces. Transference of information between the two environments occurred; however the two environments were by no means integrated. The distance education model was a "study apart" mode with materials provided for private study, where the learning environment was entirely that of the learner, except when residential components were provided. Those universities that offered these residential components provided an environment similar to the on-campus experience, although usually in a more intense format.

The introduction of a unified national higher education system proposed in 1988 (Dawkins, 1988) saw significant changes to the landscape of universities. Reforms included:

- the removal of the binary divide between universities and colleges of advanced education
- a requirement for "a minimum sustainable student load of at least 2000 effective full time student units (EFTSU)" (p.29)
- competition "for teaching and research resources on the basis of institutional merit and capacity" (p.28)

- priority in the allocation of student intakes given to professionally based courses in the fields of Engineering, Information Technology and Mathematics, Business and Asian studies (p.17)
- funding changes including a greater reliance on money from community organizations and industry (p. 11-12)
- greater opportunities for equity in study, not only in relation to financial disadvantage, but in the areas of part-time and distance education, adult re-education and more systematic credit transfer arrangements

These changes necessitated a change to the role of universities. No longer was the learner a full-time, on-campus student attending lectures and tutorials, or a distance education student utilizing a separate off-campus "study by oneself" mode. The focus had shifted to one of life-long learning that necessitated easier transference between universities and modes of study (i.e. on-campus full time, on-campus part-time, distance education, postgraduate courses). As indicated in the Dawkins white paper,

> there is an increasing recognition of the importance of lifelong education and, in particular, the need for further education and training during working life. The higher education system will play an important part in responding to the growing pressure for skills development and enhancement (Dawkins, 1988, p. 16).

This shift in educational role to lifelong learning, linked to education and training for work roles, necessitated the focus of the learning environment to change, moving away from the provided environment of the higher education institution towards a learning environment constructed by the learner that travels with the learner and interfaces with the university's learning environment.

At the same time, universities were required to provide more flexible learning environments than have been available in the past (Beattie & James, 1997; Kavanagh, Marjanovic, & Brown, 2001). This was due to a number of factors including:

- the increase in the need for greater flexibility in the opportunities for learning, particularly in time and location
- the necessary merger of institutions to meet the size requirements resulting in larger multi-campus universities that need to efficiently and cost-effectively provide courses across diverse locations
- the increased pressure to improve retention rates thus providing bridging and remedial courses at times outside the normal semester

These changes necessitated a greater reliance on technology-enabled learning environments, as they were seen to provide a flexible and cost-effective solution to the increase in course requirements and opportunities for study that did not lock the learner into attending a university at a particular time and place. As such, online and blended learning environments increased (Swanson & Kayler, 2011; Thomas, Green, & Lynch, 2011) which, with the advances in technology that include the Internet and online communications, now encompass both the physical and the virtual environment. As Swanson and Kaylor (2011) suggest, "blended learning is much less about geography (where the student is sitting) and more about a rich learning experience that combines the best of both worlds" (p. 796). This move to incorporate online technologies into the learning environment "reflect[s] a strong constructivist undertone as they are more focused on collaborative learning and knowledge construction" (Thomas et al., 2011, p. 277), shifting the focus from teacher-centered to learner-centered.

1.3 Constructivism and the learning environment

To complement this flexibility of access and the shift to a more learner-centered approach to learning, there is also a move pedagogically from the behaviourist view of learning, coupled with didactic approaches, towards a constructivist view of learning (Jordan, Carlile, & Stack, 2008). According to the constructivist view,

> knowledge is constructed, not transmitted. Individuals make sense of their world and everything with which they come in contact by constructing their own representations or models of their experiences. ... Constructivists believe that … teaching is a process of helping learners to

> construct their own meaning from the experiences they have by providing those experiences and guiding the meaning-making process (Jonassen, Peck, & Wilson, 1999 p. 3).

This move towards a more "student-centered learning" approach necessitates a change in university learning environments and the way in which they become integrated with the learner's own environment. This is covered more fully in Chapter Two in relation to the pedagogy behind the provided environment for units studied at university, but at this point it is worth examining constructivism in light of the assumptions made about learning and how this affects the learning environment.

Jonassen, Peck and Wilson (1999, pp. 3-6) describe a number of assumptions about learning that characterize this constructivist approach which have a bearing on the nature of the learning environment, particularly those that incorporate technological elements. They are as follows.

1. **Constructivists believe that knowledge is constructed, not transmitted**. In the same way that learners construct their knowledge through their own representations engendered through their experiences, it could be expected that learners would construct their own environment for learning as a result of their own experiences. In a similar way to learners accepting or rejecting the knowledge the educator provides in an endeavour to incorporate it into their understanding, so learners will accept or reject elements of the provided environment as they endeavour to construct their own learning environment to support their learning.

2. **Knowledge construction results from activity, so knowledge is embedded in activity, and is anchored in, and indexed by, the context in which the learning activity occurs.** Construction implies activity as learners become active in the learning process to create meaning and understanding from knowledge for themselves, incorporating experiences and interactions they

engage in. These experiences and interactions are embedded in a context that is inextricably linked with the environment. As Schunk (2004) indicates when he refers to

> dialectic constructivism which holds that knowledge derives from interaction between persons and their environments. Constructions are not invariably bound to the external world nor are they wholly the result of the workings of the mind; rather they reflect the outcomes of mental contradictions that result from interactions with the environment (p. 289).

As a consequence the nature of the environment that the learner has constructed requires consideration as part of the process of a constructivist approach to learning.

3. **Meaning is in the mind of the knower, therefore there are multiple perspectives on the world**. Once again the focus here is on the learner's perception; each learner has a unique perspective of his/her understanding of the knowledge being learnt, with a unique environment that is constructed and used to generate that meaning.

4. **Meaning-making is prompted by a need or a desire to know and so involves personal ownership.** Just as the construction of meaning is unique and it is the ownership of what is learnt that makes that knowledge more relevant and important to the learner, so the environment that supports this meaning-making process is unique and its construction by the learner helps to develop that sense of ownership of the environment that supports the learning.

5. **Meaning may also be shared with others, so meaning-making can also result from conversation**. One aspect of constructivism is that of social constructivism that relies on "a process of negotiation among participants through dialogues or conversations" (Jonassen et al., 1999, p. 5). Hence an environment is required that can support these dialogues and conversations.

Using these assumptions it is possible for the educator to generate a rich learning environment that can "support individuals or groups as they attempt to negotiate multiple rather than singular points of view, reconcile competing and conflicting perspectives and construct personally relevant meaning accordingly" (Land & Hannafin, 2000, p. 4). This type of learning environment is one based upon the constructivist principles that underpin a learner-centered approach to learning, coupled with the advances in technology that enable flexibility in both time and place. Goodyear proposes such an environment when he postulated his schema for the educational design problem-space as shown in Figure 1.

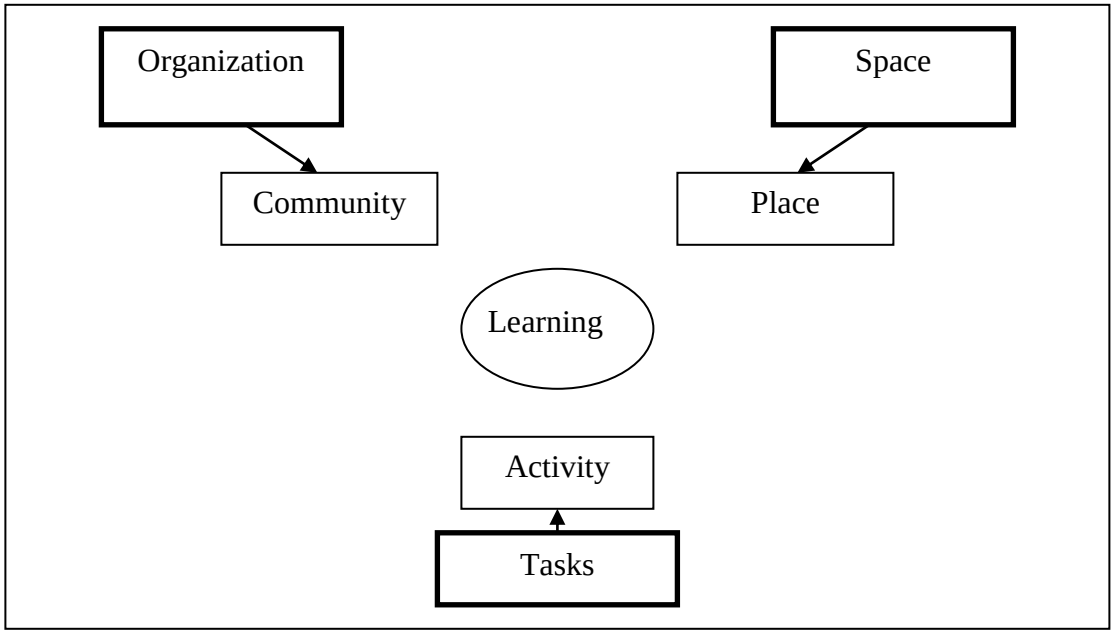


Figure 1: The educational design problem-space (Goodyear, 2002, p. 65, Figure 4.3)

This schema recognizes that learning, and hence the learner, is central to educational design as the learner constructs her/her own knowledge (assumptions 1 and 4 above) and that the learner's activity is an essential part of the learning process (assumption 2 above). It also recognizes that learning is situated socially (assumption 5 above), which requires interaction with teachers and peers through a learning community, and physically, through the influence of the tools, technologies and resources that are available to the learner.

However, it is not enough to provide an environment built on constructivist principles and assume that all learners will utilize that environment as intended by the educator. Just as there are multiple perspectives on the meaning associated with learning (assumption 3 above), there are multiple perspectives on the environment provided to support that meaning-making. As von Glasersfeld (1996) comments regarding educators approaching teaching from a constructivist position,

> too often teaching strategies and procedures seem to spring from the naive assumption that what we ourselves perceive and infer from our perceptions is there, ready-made, for the students to pick up, if only they had the will to do so. This overlooks the basic point that the way we segment the flow of our experience, and the way we relate the pieces we have isolated, is and necessarily remains an essentially subjective matter. Hence, when we intend to stimulate and enhance a student's learning, we cannot afford to forget that knowledge does not exist outside a person's mind (von Glasersfeld, 1996, p. 5).

Thus the investigation of the construction and use of the learner's learning environment from his/her unique perspective is needed to provide a learning environment to support a constructivist approach to learning that is effective for all learners.

1.4 Need for the study

Around the turn of the century, there was a recognition that "faculty need to learn to manage critical dimensions of the new environment in which their courses are taking place, dimensions like metaphor, meaning, culture, roles, time, awareness, and collaboration" (Kimball, 1998 p. 27), but this is only half of the equation. Now, with this learner-centered, constructivist approach to learning and greater use of technology, combined with the pressures of 21st century living and the increasing number of people taking up tertiary study, there is a greater need than ever to determine how a learner constructs and uses his/her learning environment and what influences, needs or characteristics of the learner impact on the construction and use of that learning

environment. Learners may not be aware of the drivers behind the construction and use of their learning environments. They may have an intuitive preference for something or a dislike of something else. They may use something because it seems to work for them or because they have been told to use it by the lecturer. Yet, just as the role of the educator is one of providing guidance to the learner to help them construct their own understandings, the educator needs to provide guidance to help the learner construct his/her own effective learning environment. This is not possible if the educator has little understanding of the nature of the construction and use of the learner's own environment and what drives that construction and use. While monitoring systems such as the one described by Judd and Kennedy (2005) can provide an insight into the actual use of technology applications by providing data for the "what" that is being used, it does not determine the "why".

This study attempts to provide some insight into that "why" and the impact that "why" has on this construction and use of the learning environment from the learner's perspective. Information from such a study has ramifications, not only for the individual learner, but also for educators and educational designers, and ultimately for higher education institutions.

1.5 Purpose of the study – research questions

The purpose of this study is to investigate how learners construct and use their learning environment (i.e. what they use from what is provided, what they discard; what they add), what influences this construction, and what impact these influences have on the construction and use of this learning environment.

The specific questions that are asked are:

1. What are the needs and characteristics of the learner, and the influences (both internal and external) on the learner, that impact on the construction and use of his/her learning environment?
2. How do these needs, characteristics and influences impact on the learner's learning environment in terms of its construction and use?

The study uses an abductive research strategy (Blaikie, 2009) that incorporates a phenomenographic research methodology within the interpretivist research paradigm (Marton, 1986; Schutz, 1967), investigating through semi-structured interviews the nature of the learner's learning environment (Seidman, 1998). It uses a grounded theory approach to the data analysis (Strauss & Corbin, 1990), coupled with the personality type of the participants, as determined by the Myers-Briggs Type Indicator® (MBTI®), to answer the research questions.

1.6 The structure of the thesis

Chapter one provides the research background for this study, outlining the need for the study and giving the purpose of this study, the research questions asked and an overview of the approach to the investigation. It also provides some background to learning environments within the higher education sector in light of changes to the sector from the late 1980's and the relationship of constructivist learning principles to that of the learning environment. It then provides an outline of the structure of the thesis chapter by chapter.

Chapter two provides a review of the literature associated with learning environments and the topic of this study. It presents a view of learning environments that encompasses the provided learning environment as determined by the educator/designer, the learning environment as constructed by the learner, and the link between these two views through the use of elements of the provided environment.

Chapter three describes the methodology used in the study, including the research problem and the questions to address the problem, together with the research strategy, paradigm and methodology used to approach this problem. It outlines the data sources and data collection methods, and provides a step-by-step description of the data analysis. The chapter concludes with information on the validity of the data and issues and limitations of the study.

Chapter four covers the results and analysis of the data. The findings indicated three main "drivers" that impact on the construction and use of the learner's learning environment. This chapter focuses on driver one – "Impetus to learn". It provides a detailed description of the attributes of the six sub-categories of this driver, together with a detailed analysis of the construction and use of the learner's learning environment as influenced by "impetus to learn".

Chapter five covers the results and analysis of the data in relation to the second driver – "Self-perceived technology ability". It provides a detailed description of the attributes of the five sub-categories of this driver, together with a detailed analysis of the construction and use of the learner's learning environment as influenced by "self-perceived technology ability".

Chapter six covers the results and analysis of the data in relation to the third driver – "Personality type" as determined from the MBTI®. It provides a description of the attributes of the four main dimensions of the personality type, together with a detailed analysis of the construction and use of the learner's learning environment as influenced by each dimension.

Chapter seven discusses the findings from chapters four, five and six, looking at the combined effect of the drivers. It revisits the model of learning environments developed in the literature review and discusses the learner constructed environment in relation to the pedagogical approach of the provided environment, the design of the provided environment and the individual elements of the learning environment. Examples of individual participants are described for each section, showing the combined effect of the drivers on the learner's learning environment and the relationship of that constructed environment to the provided environment.

Chapter eight concludes the study, discussing the implications of the findings for educational strategies in relation to the design of units and higher education learning environments. It also provides possibilities for further areas of research.

2 Chapter Two – Literature Review

2.1 Introduction

The field of learning environments is a complex one, involving approaches to their development and evaluation from many differing perspectives. In endeavouring to present a review of the literature on the wealth of research in this area and the related work of this thesis, the model shown in Figure 2 has been developed to illustrate the relationships between these areas.

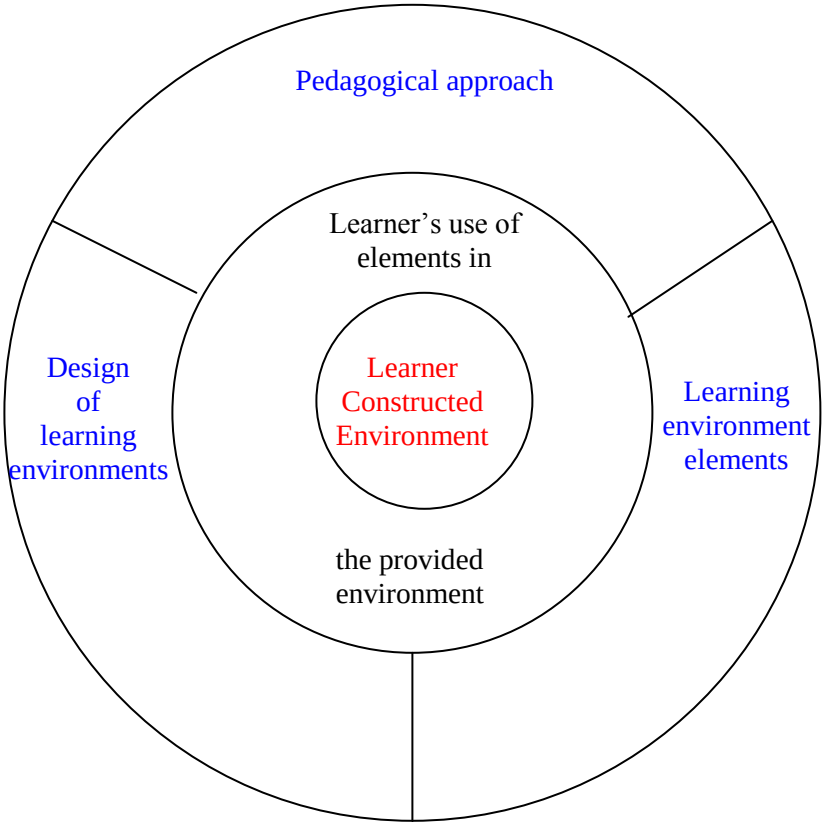


Figure 2: Model showing aspects of learning environment research

The diagram shown in Figure 2 is a representation of the research associated with learning environments and the research direction in this thesis. In this diagram, the outer circle represents approaches to learning environment research that is external to the learner. This has been separated into three different areas or foci of research: 1) the pedagogical approach that influences the construction of the learning environment; 2) the design of learning environments through the use of a specific design approach; and 3) the elements of the environment and the associated technology that make up the learning environment. These aspects of the learning environment are determined by an educator and/or educational designer and determine the provided learning environment for a unit of study at University.

The inner circle of the diagram represents approaches to learning environment research that is internal to the learner (i.e. his/her own learner constructed learning environment). These aspects of the learning environment are determined by the learner and utilize the provided unit environment, together with additions made by the learner as guided by various drivers. This learner constructed environment, and the drivers that impact on its construction and use, are the focus of the research informing this thesis.

The middle circle of the diagram represents research that forms a link between research focused on the provided unit environment (the outer circle) and research about the learner constructed environment (the inner circle). The research in this area currently explores the use of the provided environment in terms of various aspects of student evaluation and learner characteristics. The learning environments studied are still driven by the educator/designer but are examined in terms of the learner's use of the learning environment, hence providing a connection between the examination of learning environments external to the learner and the examination of learning environments internal to the learner.

While these approaches to learning environment research are shown as separate components, it should be noted that there is overlap and integration between the different areas. These approaches have been separated out in this literature review to

highlight the particular focus of that aspect of research, rather than presenting them as independent, stand-alone areas. Commencing with the pedagogical approach that influences the construction of the learning environment, a review of literature for each of these areas follows.

2.2 The pedagogical approach that influences the construction of the learning environment

Research about learning environments categorized under "pedagogical approach", as shown in Figure 2, investigates particular pedagogies that result in the construction of a learning environment. Because of this emphasis on pedagogy, research in this category has no specific design approach employed to develop the environment, nor is there a focus on particular features or elements of the environment. The structure of the environment and the elements that comprise it emerge as needed as a result of the pedagogy addressed.

There are many theories of teaching and learning, but perhaps the most influential in impacting on the pedagogy, and hence learning environments, is that of the constructivist approach to learning. The advent and uptake of this approach has seen a shift from a content delivery style of pedagogy to one that recognizes that "individuals make sense of their world and everything with which they come in contact by constructing their own representations or models of their experiences" (Jonassen et al., 1999 p. 3). The learning represented here in this definition is centered on the individual, with the learning environments facilitating knowledge construction set within a context in which we learn. Constructivist perspectives therefore draw on understandings of the learner that focus on individual meaning-making from particular contexts. This suggests that the environment needs to encompass activity embedded in a context for learning to occur.

However, there is a parallel argument to constructivism that suggests that activity does not occur in isolation from other people and that there is also a social and communicative aspect to the learning. Social constructivism, based on the work of Vygotsky, is the development of reasoning and the acquisition of knowledge determined

by social and cultural factors and situations (Vygotsky, 1994). Vygotsky theorized a concept known as the "zone of proximal development" - that is, the potential ability of the learner that can be achieved when learning in cooperation with another. In Vygotsky's work this was focused on the child and his/her development in association with an adult, however the important premise here is that "the source of development in mental processes is always social" (Vygotsky, 1987, p. 306). The inclusion of social constructivism means the learning environment needs to encompass activities, not only for learning set within a context, but one that incorporates language and communication. As Duffy and Cunningham (1996) indicate "... the sociocultural approach emphasizes the socially and culturally situated context of cognition. ...this approach examines the social origins of cognition, for example, the individual's appropriation of language as a mediating tool to construct meaning" (pp. 175 - 176). It involves dialogue between all participants in the learning experience as part of that environment (Laurillard, 2002). The learning process becomes one that engenders a joint construction with shared goals to achieve a consensus about the body of knowledge that forms the focus of the context for learning (Bruffee, 1999). Its emphasis is on activity and the construction of understanding of the concepts and processes relating to the body of knowledge with which the learner wishes to engage.

2.2.1 Authentic learning

Using constructivist theory, a number of pedagogical approaches have developed that impact on the nature of the learning environment provided by the educator. One of these is authentic learning. The focus here is on providing "an authentic context that reflects the way the knowledge will be used in real-life" (Herrington & Herrington, 2006 p. 4).

The environments that support such approaches need certain features to be present. Herrington and Herrington (2006) describe certain characteristics of authentic learning that are needed for this approach to be successful. The first is that of providing an **authentic context** that reflects the real-life situation. This implies that the environment has to provide information in a manner that enables the learner to access this information as, and when, they need it, and not in the traditional linear sequence that is common to the tertiary education environment. For example, Jones (2006), in teaching

post-graduate practitioners in the management area, used the setting of a restaurant as the authentic context. The students had access to a "company web site" that provided information about the company, together with a discussion environment that allowed the various roles in the restaurant to communicate, with the purpose of developing negotiation skills. The students were allocated a management or an employee role in the restaurant, reversed half-way through the semester. They were then exposed to a number of negotiation situations associated with working in a restaurant. The online environment enabled the learners to access relevant material at pertinent points in the negotiations, as well as enabling the educators to provide updates, such as union information and minutes of management meetings, to the "employees" of the restaurant.

The second characteristic is that activities developed will present **problems that are complex, open-ended and often ill-defined** and that develop over time. For example Jerram (2006) included in her course "simulated 'real-life' projects [that] became the primary assessment activity. These projects recreated, as much as possible, authentic situations that students would face in their future careers and workplaces" (p. 110). As there is no single "right" answer to these types of problems, such activities need to be viewed from a number of differing perspectives and require collaborative processes to enable solutions to be explored and a consensus to be gained. This requires an environment that enables opportunities for collaborative discussion and development to occur. Milter and Stinson (1999) did this, using nine major projects as the environment base for a Masters of Business Administration program run online. The learners worked in small groups, collaborating online using Lotus Domino, an online conferencing system. This online work was interspersed with face-to-face residential sessions conducted between each of the projects to provide debriefing for the project just completed and an introduction to the next project, thus utilizing different media forms for their collaboration and discussion.

The third characteristic is that of **access to experts** to enable the learner to observe the processes the expert employs when working in their profession. In this way the expert models the skills and aptitudes the learner needs to develop. The environment requires

access to these experts, whether through direct face-to-face contact or through online means, both for observation of their processes and direct discussion.

The fourth is that of encouraging learners to explore **multiple roles and perspectives**. Environments that cross discipline boundaries are needed to support this characteristic with access to information from a variety of different disciplinary sources.

The fifth characteristic is that of **collaborative construction of knowledge**. The environment needs to be one that helps "students converse with ever increasing facility in the language of the communities they want to join, … creating social conditions in which students can become reacculturated into those communities" (Bruffee, 1999 p. 73). Parry and Reynoldson (2006) found that, for postgraduate students studying economics who were already working in their professions, the opportunity to explore and discuss subject applications was far more valuable than knowledge of the subject content. They also found that learning in an authentic environment enabled a much more satisfactory incorporation of economics into their professional business environment. In this type of environment, the educator becomes a facilitator of the collaboration, providing appropriate scaffolding and guidance as needed, and the learning environment now becomes a space "in which knowledge, experience, and depth of understanding can be shared between and among peers" (Kenton, Sadera, & Frazier, 2004 p. 766). Communication environments need, therefore, to be flexible enough to accommodate a variety of group structures and approaches using differing levels of technology (e.g. face-to-face meetings, online synchronous and asynchronous discussion environments), and a document environment that lends itself to collaborative construction of knowledge.

Koenders' work (2006) illustrates the above five characteristics of authentic learning. The activity for an introductory Biology unit was that of the development of a research grant proposal to search for life on Jupiter's moon Europa as part of a larger international mission to this satellite. This was seen to be an authentic context (characteristic one) as NASA (National Aeronautics and Space Administration) is

working on the search for extra-terrestrial life, making the context relevant and current. The activity of writing a grant proposal that required collaboration of physically distant participants presented an ill-defined, complex problem (characteristic two), as the learners were required to define their specific proposal detail from proposal guidelines and broad areas of investigation. Online resources such as professional journals, educators, and NASA publications provided access to expert information (characteristic three) that was also authentic. The use of online asynchronous forums for both small group and class discussion provided the opportunity to be exposed to a greater number of differing perspectives than might have occurred when constrained by time and location in a face-to-face environment (characteristic four). These discussion forums also provided a collaborative environment that enabled the learners to develop a sense of shared responsibility for the learning outcomes, not only of their own group's work, but that of the whole class (characteristic five). Hence the authentic learning pedagogical approach engendered a provided environment dictated by the characteristics of the pedagogy.

2.2.2 Experiential learning

A second pedagogical approach that aligns well with authentic learning is that of experiential learning. Kolb (1984) indicates that humans are a learning species and our learning and ability to adapt and change over time is inextricably linked with our experiences. He defines experiential learning as "the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p. 41). In terms of the learning environment,

> a rapidly expanding applied technology [has emerged] for experiential learning. … There has developed an immense variety of tasks, structured exercises, simulations, cases, games, observation tools, role-plays, skill practice routines, and so on. The common core of these technologies is a **simulated situation designed to create personal experiences** for learners that serve to initiate their own process of inquiry and understanding (Kolb, 1984 p. 11).

The environments that support the experiential learning pedagogical approach use differing levels of physical and virtual environments. Abdulwahed and Nagy (2009) based their environment on Kolb's experiential learning theory of development (Kolb, 1984) encompassing simulation, reflection, abstraction and experimentation for process control laboratory work in a Chemical Engineering department. They had an environment that used preparatory virtual laboratory experiences to aid in the abstract conceptualization phase, combined with hands-on laboratory experience for the active experimentation phase, thus making use of both the physical and virtual environments. Staley and MacKenzie (2000) also based the model for their environment on Kolb's work using an experience, planning, reflection and conceptualization cycle for their experiential learning model (Kolb, 1984). This time, however, the environment was entirely online, using "virtual real life" experiences generated using simulations, games and "real-life" multimedia case studies. The model indicated that the planning phase to assist the connection of theory and practice could be achieved through electronic learning contracts that made objectives, strategies and outcomes explicit; threaded discussion could be used to promote dialogue and collaborative learning through reflection upon experiences and relating theory to practice; and conceptualization of knowledge and theories could be achieved through electronic mind maps and web activities. Vogel, Kennedy and Kwok (2009) went one step further, looking at an environment that is inextricably linked with the learner. They did this by investigating education using a more ubiquitous model of experiential learning via mobile learning devices such as smart phones and personal digital assistants (PDAs). They saw the ubiquitous nature of these devices as "a form of wearable technology that places students in the center of their own unique learning environment" (Vogel et al., 2009 p. 473), hence enabling true experiential learning that provides a more integrative learner centered environment not confined to a specific educational setting.

2.2.3 Problem-based learning

A third pedagogical approach that also uses constructivist principles, is closely aligned with authentic learning, and makes use of experiential type processes, is problem-based learning (PBL). Problem-based learning began with work done by Barrows in 1963 to develop a simulated patient as a standardized patient problem for third year medical

students. This approach exposed a lack of ability of students to apply their knowledge to a patient problem. During a sabbatical at McMaster University he began his work on the prototype development of “problem boxes” for clinical application. In 1971 he returned to McMaster University and began work on developing the techniques of problem-based learning, setting up a pilot program in PBL for the neuroscience portion of the curriculum. In 1974 the focus shifted from linearly sequenced problems to a more realistic patient problem that allowed the students to take actions in relation to the problem in any sequence, thus beginning the format of PBL which enables a student-centered approach that simultaneously develops knowledge, reasoning and problem-solving skills and processes, and study skills (Barrows & Tamblyn, 1980). This approach, therefore, presents an ill-defined real-life problem in the form of a scenario, often with limited information, and requires the learner to take on a role within that scenario in order to find an appropriate solution to the problem. Its focus is on **teaching the process of acquiring knowledge** rather than the presenting of that knowledge. Therefore

> the abilities that are specifically needed through problem-based learning are skills such as retrieving information, analyzing data, generating hypotheses, appraising critically, seeing connections between disciplines and producing innovative ideas yourself. They are about learning how to learn (Rogers, 2007 p. 165).

PBL has a number of features that engender a particular type of learning environment. The first is that of a **realistic scenario** that presents the initial problem or part of the problem to the learners as a substitute for exposure to the real life situation. One of the ways to provide such scenarios is through the use of media technology, such as Keppell’s (2006) work that used a variety of media technologies such as a sequence of static images or a video clip to provide a trigger for the initial scenarios.

The second feature is to provide a **resource base** so that learners can access material and experts to support their exploration as, and when, required. In PBL environments,

the teacher acts as a facilitator, and lectures act as an information resource rather than the central teaching vehicle, hence becoming part of the resource base. Such an environment needs to "support learners' active questioning of instructors and content experts, as well as receiving information from them. It will support the learners' active exploration and manipulation of material" (Ben-Jacob, Levin, & Ben-Jacob, 2000 p. 202 - 203). Cheshir, Newland and Benjamin (2008), for example, used a range of quality electronic resources to support their problem-based learning work. They found that 80% of their learners accessed library information from home, so developed an integrated resource environment that included e-journals, e-books, and scanned materials (e.g. lecture notes) to support the final year Engineering PBL course.

The third feature of a PBL environment is the provision of a **collaborative environment** to support the development of problem solving and communication skills and the collaborative group development of a solution to the problem. The collaborative learning environment may utilize face-to-face small group situations, or, as in the case of Lee, Yoo and You (2009), one that is computer supported. They used this environment to support their online PBL, using a variety of support strategies to develop collaborative problem-solving and communication skills. These included up-front training, content-related process scripts and scaffolding from the teacher.

As for authentic learning and experiential learning, we see the construction of a provided learning environment with particular features that is driven by the pedagogy: in this case problem-based learning.

2.2.4 The pedagogy of distance education

There has also been an examination of the pedagogy behind distance education in order to engender more successful distance education. McIsaac and Gunawardena (1996) described four theoretical constructs which provide an understanding of distance education that subsequently impact on the type of environment created. The first is **transactional distance** (first introduced by Moore (1990)), determined by the amount of dialogue between the teacher and the learner and the opportunities for dialogue built into the course design. This transactional distance reduces for environments with greater

learner control. Having an environment that provides communication facilities (e.g. email, phone, online asynchronous and synchronous discussion forums) will reduce this distance and empower the learner. This transactional distance was explored by Benson and Samarawickrema (2009) when they looked at aspects of separation for differing environments using mobile and Web 2.0 technologies for courses located on-campus, off-campus – including home or work – or trans-nationally. They saw these contexts for learning having an impact on the design of e-learning environments, as the technology enabled greater group interaction, while at the same time introducing an element of distance not present in the face-to-face context. They suggested that focusing on transactional distance when developing e-learning environments ensured appropriate constructs are built into the design, such as access issues, pedagogical approach, resources, skill development, structure and support for learners.

The second construct is **interaction**. This includes teacher-student interaction, peer interaction, learner-content interaction (all introduced by Moore (1989)) and learner-interface interaction (introduced by Hillman, Willis and Gunawardena (1994)). Hence environments require appropriate interfaces that make the environment easy to use, that provide access to rich content resources, and that enable dialogue. Research is being conducted in this area to make web-based environments adaptive to the learner's needs based on characteristics such as learning styles, cognitive styles and gender (Magoulas & Chen, 2006b).

The third construct is the **level of control by the learner**. This "requires striking a balance among three factors: a learner's independence (the opportunity to make choices), competence (ability and skill), and support (both human and material)" (McIsaac & Gunawardena, 1996 p. 407). Hence a learning space is needed that provides opportunities for learners to construct an environment that fits their needs, while still providing the necessary support and guidance to enable learning outcomes to be achieved.

The fourth construct is that of the **social context** of the environment. This is about recognizing that features of an environment are not culturally or socially neutral. There must be appropriate training, support, and recognition that particular technology-based environments (e.g. online forums, email) use predominantly text-based learning modes, which may suit some learners more than others. For example McLoughlin (1999) recognized that a more community oriented environment congruent with Aboriginal values was required for a web-site for Indigenous Australians.

In this section, various pedagogical approaches that influence the construction of the provided learning environment have been examined. With an underlying focus on constructivism, approaches such as authentic learning, experiential learning, problem-based learning and the pedagogy behind distance education have been considered. The important aspect of this research in relation to learning environments is how the selection of a particular pedagogical approach by the educator influences the features that appear in the learning environment itself and the purpose for which the educator conceives they will be used. As this thesis focuses on the learner's construction and use of his/her learning environment, some discussion is needed of the role, if any, the pedagogical approach plays in this construction. This discussion is taken up in chapter seven of this thesis.

The next section will examine the literature from the perspective of the features, or elements, of the environment.

2.3 The elements of the environment and the associated technology

Research about learning environments categorized under "the elements of the environment and the associated technology" commences any investigation with the elements of the learning environment. It is primarily concerned with the elements, either individually or as a complete package, that comprise the learning environment, and other issues such as pedagogy and learning environment design would only be considered peripherally. In this area of research there is often a particular focus on technology-based elements such as computer-mediated communication and electronic

and web-based resources, as well as the investigation of such technological elements in relation to what is considered the more traditional face-to-face educational environment. This area of research is extensive, and what has been presented here is a sampling across the areas to highlight the areas of focus of research and the types of elements investigated.

2.3.1 Cooperative group work

This is an area of research that was investigated in the last decade of the 20th century quite extensively, when constructivist principles were being embraced widely by the tertiary education community. Various products such as Lotus Notes and Basic Support for Cooperative Work (BSCW) were available and educators were keen to utilize their features, as they combined document sharing with communication facilities. For example, Hinssen (1998) looked at the use of Lotus Notes for this type of collaborative work, which provided electronic mail, database support and document sharing, and a scheduling function. He found a significant relationship between group task interdependence and the amount of information exchanged. Holtham, D'Cruz and Tiwari (1998) also used Lotus Notes for supporting face-to-face collaborative learning. They had some logistical problems, but despite this, they received a positive response from students to the use of the technology. They found that higher levels of collaboration were observed but these levels required greater student effort, while teachers found the visibility of all contributions helpful in allocating individual assessment. Yet another form of groupware, BSCW (Basic Support for Cooperative Work), was used by Macauley and her colleagues (Macauley, Shaikh, & Young, 1998) for Software Engineering students. They found that while students shared information, the cohesiveness and interaction of the group was lacking, so the information sharing aspects of the groupware were useful, but the communication aspects less so. As technology advanced, with web-based products appearing, the use of such groupware products diminished and educators started combining existing tools to provide a cooperative and collaborative environment. For example Alem and McLean (2005) set up an environment for natural resource management to enable the development of relationships between groups, with access to resources and models and the ability to create shared plans and strategies. This was done though access to collaborative

technology (e.g. forums, emails), document resources (e.g. repositories, web, query and search engines) and knowledge model and map construction using simulation software. They found this was useful for all students, but particularly for those with a low level of domain knowledge, who showed greater levels of learning gains than those with high domain knowledge. This suggests that this combinatory arrangement of elements forming the unit's learning environment was proving effective for student learning, and as such becomes the stepping stone for the development of Learning Management Systems.

2.3.2 Learning Management Systems

To accommodate the need for environments that provided a range of tools for content support, content management and communication, as well as course management features, Learning Management Systems (LMSs) were being developed. The pre-cursor to these systems began in 1960 with the PLATO (Programmed Logic for Automated Teaching Operations) system. This system was primarily concerned with delivering content using a computer that enabled three levels of access – that of "student" (who could study assigned material), "instructor" (who could monitor student progress as well as study material) and "author" (who could create lessons as well as carry out all the instructor functions). By mid-1990 the focus was on authoring tools such as Macromedia's Authorware and SumTotal System's (formerly Asymetrix Corporation) Multimedia Toolbook. The aim of these tools was to provide customized instruction, but they declined in popularity with the advent of the World Wide Web and web-authoring tools based around HTML (HyperText Markup Language). WebCT (the name derived from Web Course Tools), developed at the University of British Columbia in 1996, and Cecil, developed at the University of Auckland in the same year, were the first of the systems that are now recognized as Learning Management Systems. They incorporated not only authoring tools for content pages and the ability to include links to reference materials, but communication tools such as email and asynchronous online communication, as well as monitoring and grading tools for instructors (Chapman, 2005; Sheridan, Gardner, & White, 2002). Blackboard followed soon after in 1997, releasing their first learning management system in 1998, which offered similar features to WebCT (Bradford, Porciello, Balkon, & Backus, 2007). These products continued to

grow and expand their features (e.g. synchronous discussion, interactive whiteboards, blogs, wikis), with other commercial products such as First Class entering the market, as well as open source systems such as Moodle (Modular Object-Oriented Dynamic Learning Environment) and Sakai, and proprietary systems developed for specific higher education institutions. Inevitably, research has looked at, and continues to look at, the learning environment engendered through the Learning Management System (LMS) as discussed below.

One area of research into Learning Management Systems has focused on **features within the Learning Management System**. Crawford and Kevill (2000) investigated the use of WebCT as the major part of the learning environment. They evaluated two courses with associated aspects of the LMS to support the course structure. The first used a teacher-centered, very structured use of WebCT for delivering and administering multiple-choice quizzes in association with a sub-unit of a course defined by the chapter of a text book; the second used a student-centered project approach using WebCT for group communication – forums for assistance, providing information, discussing with other students – and for providing feedback. These environments attempted to align particular features of the LMS with particular pedagogical approaches. The first approach combined the more structured approach with a staged assessment and feedback mechanism, which assisted students to stay on track, although those students not confident with using computers found the tests and feedback were of little use. The more collaborative student-centered pedagogical approach of the second course made use of the collaborative features of WebCT such as bulletin boards, asynchronous forums and shared web page development. In this approach a greater variety of responses occurred towards the approach and environment of the course. Positive comments indicated that WebCT was considered an interesting, stimulating and motivating environment for independent learning. This was contrasted with lack of external motivation for those struggling with self-directed learning, and considerable issues with group work. Once again there were some issues with the use of the technology. Sherer and Shea (2002) looked at extending the use of Learning Management Systems to incorporate activities beyond the classroom to supplement and

extend the face-to-face environment. They examined the features of the LMS tools such as email, bulletin boards, chat rooms, lecture content, video-conferencing and online assessment, exploring ways in which they might be used "to enhance the 'outside the classroom' environment" (p. 15). These studies show that the research into the elements of the environment focus less on the actual elements used and more on the ways in which the students incorporate these elements into their own learning environment to achieve successful learning.

This flexibility and range of tools incorporated into the Learning Management System has led the research into Learning Management Systems where the LMS is considered as the entire online learning environment for a unit. This has led, inevitably, to evaluations of a **range of Learning Management Systems**. Ingraham and his colleagues (Ingraham, Watson, McDowell, Brockett, & Fitzpatrick, 2002) carried out this type of comparative evaluation for different Learning Management Systems using technical, administrative, academic, pedagogical, financial and component criteria, while Hamza, Malluhi and Alhalabi (2004) surveyed 67 institutions looking at the effectiveness of the use of LMSs. They found a lack of systematic tools available to evaluate such systems, with only 53% of institutions indicating they felt the system served them well. The major issues they identified included a lack of standardization across different LMSs, inconsistency of user-interfaces and the action sequences associated with using common features, and considerable time and effort needed to learn and master the use of the various systems. Sawers and Alexander (2000) compared the features of TopClass, WebCT and Blackboard in terms of their ease of use and most commonly requested features for the environment. These features included email facilities, small group facilities, tracking features, formatting features for content, ease of incorporation of other media forms and asynchronous chat. Their evaluations focused "not only on 'what the tool can do', but by 'how the tool is and can be used'" (p. 580), finding that the changing landscape of technological improvements, combined with the experience of the educators after using an LMS, indicated a change of LMS was needed. In an attempt to combine the best features of Learning Management Systems and avoid the issues of better features emerging in some LMSs but not in others, Su and Lee

(2003) described the design and implementation of a Learning Management System as a set of distributed and shareable components. These included content objects (i.e. learning resources) and software objects (i.e. tools for supporting e-learning). They viewed the ultimate LMS as being a web-based framework that provides process models to enable these objects to be selected and combined as needed. These examples show that the LMS is being considered as an entire learning environment, with features that can support a range of pedagogical approaches through the presentation of content, either directly or through links to resources; the support of constructivist principles, both individual and social, through the use of learner constructed web environments and tools such as blogs and wikis; and cooperative and collaborative approaches through the use of shared documents, shared whitespace and computer-mediated communication tools such as synchronous chat, asynchronous discussion forums and email.

With this move to consider the Learning Management System as a complete learning environment, research also focused on the **limitations and barriers of LMSs**. Goodell and Kusko (2005) looked at the barriers to promoting a community of inquiry among masters students when using WebCT. They found technical difficulties, a lack of user friendliness of the system and workload issues to be barriers to its use; however they did find the feedback provided for electronically submitted work was appreciated. Seo, Hasegawa and Ochimizu (2007) tackled the limitations in a different way. They proposed a "situation adaptable" LMS, giving two possible strategies for adaptation. The first was the use of a mechanism that dynamically recommended suitable teaching material based on the history of the learner's selection. The second strategy was a system that allowed the learner to annotate teaching materials, storing metadata for the materials, which was then used to inform the modification of future materials. In these approaches the system itself is adapting to the needs of the learner, either by examining the past patterns of learning or by using direct guidance from the learner. By contrast, Anma and Okamoto (2009) looked at overcoming the limitations of LMSs by approaching the development of an LMS using the functions of social networking (i.e. user profile management, learning community support, blogging facilities). These were incorporated into the more routine functions of an LMS (e.g. learning object and content

management), including some additional features such as avatars for users, and the learner or teacher role being able to be chosen by student or academic. Their intention was to raise awareness of learners' knowledge of concepts and of other users in the learning community. In this case the learner adapted his/her use of the LMS through interaction with others in the learning community, rather than the system adapting to the learner. These limitations and barriers of Learning Management Systems and the exploration of adaption of such systems by the learner to overcome these limitations and barriers, indicates that a provided system is only part of the picture of the learning environment, however extensive its features, and that the construction and use of the learner's learning environment is needed to complete the picture.

2.3.3 Computer-mediated communication

Research has also been conducted around the use of computer-mediated communication (CMC) tools to support a range of education processes including collaborative group work, discussion, online lectures and the provision of feedback. One of the areas of research into CMC tools is that of **asynchronous systems**. This area of research has been tackled in a number of ways, the first being to employ a **comparative analysis** of the asynchronous discussion environment with the more traditional face-to-face discussion environment. Taylor (1998), for example, used CMC to conduct seminars via an asynchronous conferencing system, comparing it with the face-to-face seminar. She found that discussions were more detailed in the asynchronous environment, being more "effective for interactions which involved giving and receiving information and discussing opinions, but not for those interactions which involved resolving disagreements or getting to know one another" (Taylor, 1998 p. 229). Graham, Scarborough and Goodwin (1999) also investigated the seminar environment, aiming to use CMC to mirror online what was occurring face-to-face (i.e. activities centered on group work with exercises, with each student in the group taking responsibility for one question, researching it and posting responses on the group tutorial board for discussion). They found that "the cumulative record of message contributions provided greater potential for reflective thought, analysis and review of earlier contributions than participation in FTF seminars" (Graham et al., 1999 p. 35). Ellis (2001) focused on comparing the asynchronous online forum with the more traditional face-to-face

environment for group collaborative learning. Learners saw the biggest advantages of the online forum as its convenience in time and place; the permanency of the information with opportunity to reflect later on the conversations; and the level of equity for students with a greater number participating in discussion. They saw the biggest weaknesses as lack of visual cues, and lack of immediacy of communication which caused discussion to be somewhat disjointed. Such studies show that asynchronous online systems are not a direct substitute for the face-to-face environment, as they alter the nature of the communication. While lacking in immediacy and visual cues they do provide opportunities for reflection and review, and as such are a unique communication element in their own right and not a direct substitute for face-to-face communication.

Another focus of research using asynchronous CMC is the investigation into its use for a variety of different **learning processes**. Cartwright (2000) investigated small group discussion. Her evaluation showed effective group communication with better and more opportunities for discussion; the ability to review prior comments; greater levels of, and opportunities for, reflection by students; and better collegiality within groups. Lee-Baldwin (2005) used the asynchronous forum to support and facilitate reflective thinking in small groups for pre-service teachers. She found that a more highly structured forum engendered a higher level of cognitive processing in its participants than did a less structured forum, and that those groups with the highest levels of cognitive processing displayed more interactivity and higher levels of social dialogue. Day and Batson (1995), rather than focusing on the learning processes associated with discussion, utilized the textual nature of CMC to investigate the learning process of writing. This was done by examining how the CMC environment was used to help develop writing skills in the tertiary environment. Written models provided by the teacher as a participant in the written discussion and the use of written discussion to practise writing were employed, thus engendering more collaborative writing practices, more immediate feedback at the time of writing and more equal participation in the learning process of writing. Once again we see the unique nature of the communication medium, both in terms of its asynchronous nature and its written form, providing

opportunities for a more reflective and in-depth discussion as part of the learning process.

The second area of research into CMC tools focused on the use of **synchronous systems**. Schullo, Siekmann and Szydlo (2003) looked at a range of synchronous learning environments, outlining the advantages and disadvantages of each and providing a comparative analysis of the features of such systems in terms of integration into a Learning Management System; media forms available (e.g. text, audio, video, whitespace); polling and questioning facilities; small group facilities; and usability. Boora and his colleagues (Boora et al., 2005) also looked at a complete synchronous learning environment, but this time the specific one of Elluminate Live that supports synchronous video, voice, text and shared application space. They implemented this within a Masters of Education course conducted using distance education. Students indicated that "they preferred the system because it was more like a 'real' classroom and one that they could even access from home" (p. 549), with some students even requesting their own private Elluminate sessions so that they could discuss interests in common within the environment. Others have researched the use of the synchronous environment in a support role. Wang and Newlin (2001) used a text-based chat system to augment the existing asynchronous online environment. They used it to provide regularly scheduled sessions to deliver lectures based on the materials students had downloaded, to engage in discussion and to answer students' questions. They found the chat sessions promoted better interaction, both teacher-student and student-student, and a sense of increased social presence, with the synchronous chat sessions rating more highly than other forms of virtual communication. Alvarez-Torres (2001) looked at the use of synchronous CMC to support the learning of a foreign language. She found that written debates produced more complex language than oral debates; that there was more equality of conversation between teachers and students; and that learners produced more language in graphics-based programs, but text-based programs produced higher retention of vocabulary. In this research we see that the synchronous online communication medium provides similar immediacy aspects of communication to those that exist in a face-to-face environment, with those forms that provide synchronous

voice communication resembling face-to-face the closest, but with the added advantages of flexible access. These investigations recognize that an important part of a learner's learning environment is communication, particularly in light of social constructivist educational theory, and that, when face-to-face communication is not possible, the synchronous chat environment provides the closest alternative.

The third group looked at **both asynchronous and synchronous systems**. Lai (2002) discussed the advantages of using online asynchronous and synchronous discussion for art education. She found that some of the advantages included: the breaking down of stereotypical barriers because judgments of fellow learners were not made on a visual basis; opportunities to make flexible use of the environment in both time and space; and the ability to display visuals of the art works they were critiquing (on their computer) at the same time the discussion was occurring. Some researchers focused on a **comparative analysis** of the two types of communication. Skylar (2009) looked at the lecture environment, comparing text-based lectures in the asynchronous medium with synchronous interactive web-conferencing. In a study using text lectures and quizzes for the asynchronous system and Elluminate Live for the synchronous web-conferencing system, she found that there was no significant difference in the performance of students in the course. However, with regard to satisfaction, she found there was much greater satisfaction with the web-conferencing lectures. Levin, He and Robbins (2006) also conducted a comparative analysis: in this case comparing the asynchronous and synchronous discussion environments of the LMS Blackboard. They found that the synchronous discussion environment produced higher levels of critical analysis, and that, over time, students changed their preference from the asynchronous discussion format to that of synchronous discussion. Abrams (2003) went one step further, and compared, not only asynchronous and synchronous online discussion, but also face-to-face discussion in her study of students in a German language course. She used three treatments: face-to-face small group discussion (the control group), two 50-minute synchronous chat sessions, and a week long asynchronous discussion forum. These treatments were used as the precursor to a final face-to-face class for all students. She found that, in the final face-to-face class, the control group produced the greatest

amount of speech, while the synchronous group significantly outperformed the asynchronous group. In examining the range of CMC, the asynchronous medium offers opportunities for reflection and a more detailed examination of the material, whether it is lecture material or discussion, but loses the immediacy features the synchronous medium provides – that of enabling a discussion to occur that resembles the face-to-face environment more closely.

As in the pedagogical approach and the construction of the learning environment, we see the constructivist approach to learning, in particular social constructivism, influencing the incorporation of communication elements into the provided environment to support cooperative and collaborative approaches to learning. The emphasis on CMC reflects the increasing use of technology and the idea that the learning environment can be virtual as well as physical. These examples also highlight that CMC is not an equivalent substitute for face-to-face communication, providing a range of different features (e.g. flexibility in time and place, permanency of the discussion content, opportunities for greater reflection and development of written discussion) that change the nature of the environment for the learner.

2.3.4 Other elements

There has also been research carried out on a range of other elements in the learning environments such as wikis (Elgort, Smith, & Toland, 2008), podcasts (Scutter, Stupans, Sawyer, & King, 2010), online games (Linser, Ip, Rosser, & Leigh, 2008), collaborative video-conferencing (Good, O'Connor, Greene, & Luce, 2005) and virtual worlds like Second Life (Gao, Noh, & Koehler, 2009). This research focused on what the students found the different products useful for (i.e. wikis for organizing information and sharing knowledge, podcasts for reviewing lectures, video-conferencing for supplementing lectures and extending knowledge, and online games and virtual worlds for role-play).

Other researchers took a more general approach investigating a range of tools. For example, Carswell and her colleagues (Carswell, Thomas, Petre, Price, & Richards, 1999) investigated what aspects of the Internet could support learner-centered distance education. They looked at electronic registration, electronic assignment handling, tutor

and peer online communication and electronic examinations. They found that asynchronous media provided the most successful mode for interaction of students and tutors. Email provided one-to-one student-tutor communication to assist with problem solving, while asynchronous threaded discussion was used for group discussion. Evaluation showed that participation was higher for those students with online access, and the improved speed of feedback to students for both questions and assignments enhanced the student's experience.

2.3.5 Comparison of the online and face-to-face environments

Research has also been conducted by comparing the online and the face-to-face environments. Boettcher and Cartwright (1997) discussed the specific features of web-based courses that differ from that of the on-campus mode of teaching. They suggested that the online environment requires a reappraisal of the approach to instructional design, particularly for the effective hyperlinking of materials and the use of communication media, in particular asynchronous discussion. They indicated that there is a need for a cognitive appraisal of the mechanisms for interactivity, with a focus less on academic-to- student delivery and more on peer communication combined with the learner interacting directly with learning resources. They also indicated the need for an investigation into the redesign of physical spaces to allow more flexible access to the technology at any time and in any place. Hollerbach and Mims (2007) also carried out a comparison of environments, comparing online, televised and face-to-face instructional methods for introductory mass communication and society courses. They found little difference in the acquisition of knowledge between the three groups, with all groups having a significant knowledge increase regardless of the instruction across the three experimental trials. From this they advocated a variety of different media for courses.

In this section it can be seen that a range of different elements has been considered for learning environments. The focus of this research has been on the nature of the elements themselves and what they offer within the learning environment. The research has highlighted that different media forms provide different aspects of an environment (e.g. LMSs for combining a range of tools together, asynchronous CMC for reflective discussion opportunities, synchronous discussion for "real-time" online

communication). There is a need, therefore, to consider the intended use of these elements of the environment. This is done in a number of ways: through the explicit design of the environment, the use of these elements within units, and the drivers behind the learner's use of such elements as part of their own learning environment (the focus of this thesis). The following section examines this use from the explicit design of the environment.

2.4 The design of learning environments

Research about learning environments categorized under "the design of learning environments" focuses on the intentional design of a learning environment by an educator and/or designer. It is the linkage point between the pedagogy and the elements of the environment. Some design approaches are based on pedagogy (i.e. such pedagogies as authentic learning or problem-based learning as covered in the first section of this review); some are based on the tools and elements that comprise the environment (e.g. CMC or LMSs as covered in the preceding section of this review); others are based on goals or activities that produce particular learning outcomes; and yet others employ a design approach that utilizes a combination of one or all of these approaches.

2.4.1 Basis for the design process

When examining the design of learning environments, one of the ways of approaching this is to focus on a particular design process, using the basis for that process as the start point. For example, Hedberg (2002) based his design process on **pedagogy**. He began with the underlying assumptions of learning that follow the constructivist approach: that it is active and engaging, it involves constructing knowledge, it is focused on thinking skills rather than finding the "right" answer and it involves social negotiation through collaboration. From these assumptions he identified attributes of high quality learning environments to include mechanisms: to support learner engagement; that are embedded in real contexts; that contain activities that challenge the learner; and that provide practice supported by feedback. He described his design process for creating such learning environments as: 1) defining the learning task space; 2) describing the learners and the approaches needed to support them to understand key concepts; 3) collecting

resources that support the solving of the learning task; 4) identifying supports needed for feedback and task completion; and 5) establishing reasons for social communication that are critical to the task completion. In contrast to Hedberg's pedagogically informed design approach, Albon and Trinidad (2002) based their design approach to a greater extent on the **use of the technology** to drive the building of a learning community that engendered a "mediated-learning approach" where

> technology is the vehicle for communication and collaboration, and the framework for mediated learning that takes place between lecturers, peers, and the wider community to produce authentic tasks, projects, or investigations (Albon & Trinidad, 2002 p. 53).

The design of the environment focused on the use of the technology but with a particular approach to learning underpinning the design (lecturer in the role of expert bringing to the unit their expertise, syllabus, content and objectives; but with learning through technology and mediation using constructivist principles).

De Boer and Collis (1999) used a different approach to both Hedberg and Albon & Trinidad, basing their design process on **rapid prototyping** to develop customized web-based environments that provided additional support for the more traditional course environments of face-to-face sessions and textbooks. A decision support tool took instructors through the use of web tools and pedagogical approaches, providing examples of ways the tool was already being used and asking questions to determine whether the tool was appropriate for this course. It provided a summary of the choices made with links to the examples. The next step in the process enabled instructors to make more efficient use of tools, incorporating new ideas for use. Then the prototype course site was generated so that instructors could practise with the tools chosen, modifying choices along the way until a final version of the support site was generated for use with the course.

These three examples show that the design process is the driver that influences the nature of the learning environment, how it is constructed, and what is considered important in that environment. In Hedberg's case the pedagogy behind the learning determines the environment; in Albon and Trinidad's work the nature of the elements determine the environment for the learning community; and in De Boer and Colis's work the mechanism of selection of tools for the environment influences the construction of the environment. The driver here is determined by the designer and educator and only minimally considers the learner.

2.4.2 Design through aspects of learning

Unlike the previous section where the driver for the construction of the learning environment is the design process, a second area of research has used particular aspects of learning and learning support to drive the design of the learning environment. For example, Burch (2001) focused on the design of web environments as they relate to **communication issues**. He discussed the architecture of the web site and design for ease of finding information and navigating around a site, the user interface that improves functionality of the site and orders the relevant information for the learner, the methods for delivering information both to and from the user, and the mechanisms provided for various forms of feedback, both from the system itself and from the human users. He also discussed various elements of web design and proposed a web communication model to ensure two-way communication and flexibility in the roles of sender and receiver.

Lin and his colleagues' work (Lin, Hmelo, Kinzer, & Secules, 1999) also used a design approach that focused on learning – in this case the technology design features that are needed to support **reflective thinking**. They described four features: process displays in which problem-solving and thinking processes are provided; process prompts in which students are provided with prompts (e.g. questions) to enable them to follow particular processes during their learning; process models where experts' thinking processes are made explicit; and reflective social discourse to allow multiple perspectives to be explored and opportunities for feedback to be provided.

Chiu and Hsu (2004) used yet another aspect of learning – that of **cooperative learning** – and the supports needed to learn in this way. They described a framework for designing a Computer Supported Cooperative Learning (CSCL) system. It looked at positive interdependence (a group succeeds only if the group members work together in a cooperative manner) which is established through "(a) mutual goals, (b) joint tasks, (c) shared resources, (d) complementary roles, (e) divided tasks, and (f) group identity" (p. 11). They also included in the CSCL system characteristics that mirrored face-to-face interaction; individual accountability for work shared and the ability to support group members where assistance is required; and cooperative skills including group role management, communication, developing consensus and mutual respect. These features resolved into a framework that included a cooperative group structure, a cooperative tasks structure, a collaborative incentive structure, an individual accountability structure, a cooperative space structure and cooperative skills instruction.

Bernard and his colleagues, by contrast, focused on collaborative rather than cooperative learning, using **collaborative online learning** for distance education as the focus for the design of their learning environment (Bernard, Rojo de Rubalcava, & St-Pierre, 2000). They saw technological advances as changing the use of the environment to one that offered a more collaborative approach to learning – that of interacting to achieve common understandings – rather than the traditional individual approach for distance education, or, as in the case of Chiu and Hsu's work, the cooperative approach where work is apportioned between the group members. They considered that such an environment should be designed using the following process: 1) initial preparation that includes an assessment of learning needs, the identification of learner profiles and the provision of initial technology training; 2) the creation of a community of learners through the provision of social spaces with at least one space being face-to-face; 3) the development of an environment for true collaboration that includes appropriate facilitation of small group work and development of learner independence; 4) the use of institute appropriate pedagogical approaches, in particular a constructivist approach that encompasses authentic, problem-based tasks; and 5) effective use of the technology by matching the medium to the instructional objectives. This design focus is very much

driven by the educator's view of what learning should be taking place, and what support needs to be built into the environment to enable this to be achieved.

2.4.3 Design of the space

A third area of research that is categorized under "design of learning environments" is one that focuses on the design of the actual space, both physical and virtual, using different approaches. For example, Cavenagh (2002) looked particularly at the design of the **face-to-face** learning environment when learners are engaged in **collaborative assignments**. He described the study space when using computers as part of this environment, suggesting a variety of arrangements for the individual groups and for the tutorial space as a whole. He then went on to discuss the features of collaborative learning in the environment, including the use of technology, social aspects and achieving group consensus.

Gillette (1999), by contrast, focused solely on the virtual learning environment. He used the principles of **architectural design** for an online web-based course for teaching writing communication. He described the design process in terms of architectural design, designing the online space as one devoted to learning. He referred to creating an entrance to the course, with an appropriate organizational structure to the aspects of the elements of the environment it contains, and talked of creating equivalent spaces to represent lecture halls, workshop spaces, research rooms, a student lounge, student gallery, and private and small group meeting places. He also provided a much broader picture that incorporated the whole university environment, suggesting that roles such as "architect, building administrator, departmental secretary, postal worker, custodian, security officer, grounds keeper, equipment purchasing officer, maintenance supervisor, and overall technical ombudsman" (Gillette, 1999 p. 25) are part of the design of an online course as well as the obvious roles of facilitator, teacher and learner. While still focused on the educator viewpoint rather than the learner viewpoint, he considered the environment in a more holistic way than other learning environment design oriented research.

Jaffee's (2003) viewpoint focused much more on the "**pedagogical ecology**" rather than the architectural approach, indicating how the environment, whether physical for face-to-face classes, or virtual for online classes, influenced the learning approach. He suggested that traditional physical spaces promote a teacher-centered, information delivery approach, whereas the virtual online space promotes a learner-centered, interactive approach. He saw the construction of online learning environments centered around four pedagogical principles – interactivity, active learning, mediation and collaboration. This is closely linked to the research that focuses on design process, but rather than starting with the process and seeing what environment is needed, he starts with the environment and determines what learning process emerges from its influence.

Norman (1998), like Jaffee, approached his research from the environmental space, using the idea of **interaction space** as the basis for his design approach. He presented a model of interaction to define the type of interactions that occur for learning between instructors, learners, and educational material. He presented this

> in terms of interface metaphors and a prototype system that provided tools for accessing materials, submitting assignments, asking questions and providing feedback, engaging in dialogue, and working on team projects (Norman, 1998 p. 39).

He referred to the interaction space (both physically and virtually) to provide the foundation for such a system; with a particular emphasis on collaborative spaces and the interactions and activities that occur within them (e.g. collective note taking, study groups, collective information searches, collaborative group work). Here Norman, like Jaffee, starts with the environment; however his work is more closely linked with aspects of learning, showing that the environment determines the nature of the aspects of learning that take place. This idea of the environment influencing the nature of the learning, and environments being inextricably linked with pedagogy is revisited in the discussion chapter of this thesis.

2.4.4 Networked learning environments

A fourth area of research in the "design of learning environments" is the area of networked learning environments. That is "learning in which communications and information technology (C&IT) is used to promote connections: between one learner and other learners, between learners and tutors; between a learning community and its learning resources" (Goodyear, 2002 p. 56). Goodyear looked at the design of networked learning environments from a variety of perspectives. He drew on a variety of features of learning and pedagogy that led him to a design of networked learning environments using a **problem space** that encompassed community (i.e. communication, co-operation, collaboration and the creation of learning communities), space, both virtual and physical, and activity (i.e. tasks that the learner engages in) (Goodyear, 2002). Following on from this earlier work, he took the problem space of educational design, and introduced the concept of **design patterns** to aid in the design of learning environments in a structured way. This allowed identification of certain problems or situations that recurred frequently (e.g. an online asynchronous discussion group, textbook), providing a pattern for the solution or use that could be used repeatedly, and subsequently incorporated into a sequence of patterns that together formed a course or unit of study (Goodyear, 2005).

Sorensen (2005) also looked at the design of a collaborative networked learning environment, but focused on **communities of practice and collaborative knowledge building**. Her model used a learner-centered design where knowledge resources (student-created, teacher-created and external resources) are dynamically available to enable learners to build knowledge through a process that is driven and motivated by the learners. She provided not only a discussion environment, but a metaforum environment to reflect and discuss the experiences of the collaborative knowledge building. Spector, Easson and Davidsen (1999) took yet another approach to the design of collaborative networked learning environments, using a design principles perspective. They focused on a socially situated perspective of learning, presenting a design framework based on **cognitive apprenticeship** that provided support and facilitation for less experienced learners that gradually reduced over time. They built in collaboration as a necessary part

of completing the desired tasks and activities, and achieving the desired goals. Similar to Sorensen's environment described above, their environment included a collaborative discussion and knowledge construction environment that utilized authentic problems, meaningful scenarios and feedback mechanisms, but with the emphasis of this environment being mediated and facilitated by those with more experience. As for environments influenced by pedagogy based on social constructivism, in this type of research we see the influence of social constructivism on the design of the environment (Salmons, 2011), both in providing an environment that supports the collaborative construction of knowledge as well as a link with the zone of proximal development for the learner through the mediation and facilitation from those with greater expertise.

Once again the collaborative nature of networked learning environments is explored in the model used to design the State University of New York (SUNY) Learning Network (Shea, Pickett, & Pelz, 2003). The model used here focused on **interaction** (both teacher- learner and learner-learner interaction). They saw an effective learning environment as having three major components: a knowledge centered component that focuses on learning outcomes; a learner centered component that engages with the learners' current understandings and their interests and motivations; and an assessment centered component that includes appropriate ways to test achievement and provide feedback to learners. They saw these components as embedded within a community environment that encouraged collaboration and enabled connections to be made to the wider communities of practice. This built on results reported by Swan (2001) that found, for this learning network, three factors that significantly influenced students' satisfaction and perceived learning: the clarity of the course design factors for the asynchronous learning network; the interaction of learners with instructors; and the active discussion between learners. Jones (2002) also examined the students' experiences of design and factors that impact on the intentions of the course within networked learning environments. He found that institutional infrastructure and unpredictability of computer networks can remove control of the environment from designers, causing students to make use of facilities not embedded in the course. He also found that student concerns outside of the course, and pressure placed on students to co-operate in assessable tasks,

impacted on the students' interpretation of assessment requirements, even when these were well designed and documented. He concluded that design needs to accommodate an awareness of the **context and the situated activity** within the learning environment.

Several similar elements within the environment emerge from these studies around networked learning, including the concept of a shared collaborative workspace that supports interaction and shared activity as well as a communication environment that supports not only discussion but the co-construction of knowledge and the interaction of learners with both their educators as well as their peers. This suggests that the underpinning educational theory of the design of the environment for networked learning is that of social constructivism – that is, a focus on educator/learner and learner/learner interactions for the purpose of the co-construction of knowledge about the particular context they are studying (Jordan et al., 2008).

2.4.5 Design of learning environments based on learner characteristics

A fifth area of focus for research into the design of learning environments is its link to the characteristics of the learner. One area of research in this category is that of the design and development of **adaptive learning environments** in web-based education that adjust to the needs of the learner. These are environments that detect the actions of the learner and adjust the environment to match the needs of the learner. The adaptations occur mainly in three areas – content level, navigation level and presentation level. These adaptations change the content provided, the directed guidance and links available, and the layout of the information respectively. Various characteristics of the learner were identified and used to direct the adaptations. These included characteristics such as gender differences (Fan & Macredie, 2006), cognitive ability (Souto, Verdin, & de Oliveira, 2006) and learning style (Castillo, Gama, & Breda, 2006). The focus here was adjusting what content is presented to the learner, in some cases adapting the environment based on tracking the learner's use in real time. For example, Joung (2005) looked at an adaptive Learning Management System design based on patterns of learner use, the quality and quantity of participation in aspects of the LMS environment, and the learner's goals of learning.

Others have used design approaches that, rather than responding to what the learner is actually doing, encourage the learner to **choose an appropriate direction** within the learning environment. For example Sternberger (2006) discussed a Hyperlearning Learning Model of design that encouraged learners to choose methods of learning that best suited their learning style. Activities that the learners selected were designed within a "game" framework (e.g. a quiz for learning effective library search techniques took the form of a self-test game) to stimulate interest.

Yet others are approaching the design of the learning environment based on **specific characteristics of learners**. In this case the adaption of the learning environment is generated from a learner profile rather than the learner's use of the environment or their choice at the time. For example, Cercone (2008) focused on the theories behind adult learning, identifying characteristics of adult learners that should influence the design of learning environments. These included the age of the learner and biological limitations this imposes, such as poorer memory and vision; external responsibilities and commitments that may interfere with the learning process; the learning style of the learner; operation as an independent self-directed learner; extensive levels of life experience; and the goal-oriented approach of adult learners. She recommended a number of features in the design of online environments to cater for these characteristics (e.g. size of fonts; good structure and navigation features; use of graphical representations to support text; opportunities for practice with good feedback; flexibility to learn at one's own pace; multiple modes of representations of content; a variety of techniques that support different learning styles – active, reflective, etc), with opportunities to tap into prior knowledge and experience and clear goals that are relevant to the adult learner's world.

This type of research is moving towards a greater awareness of the learner's influence in relation to the nature of the learning environment. It is beginning to recognize that, while a designer may have specific intentions about the use of an environment, the learner's own characteristics, or drivers as presented in this thesis, will influence that

use. The emphasis is now moving from investigating learning environments as controlled and defined by the educator and/or designer, towards learning environments as constructed and used by the learner. The next section of this literature review explores the learner's use of the provided environment.

2.5 Learner's use of the elements in the provided environment

The research associated with the learner's use of the elements of the provided environment (see middle circle in Figure 2 on page 12 of this chapter) forms the link between the educator/designer constructed learning environment and the learner constructed learning environment. This research starts with the elements of the learning environment provided by the educator/designer and looks at what this means for the learner. It is the next step towards the investigation of the learner constructed learning environment, for it provides some insight into the perceptions the learner has of the provided environment and how he/she uses that environment, which then influences the subsequent construction of his/her own learning environment. Research in this area encompasses the importance of aspects of the environment for the learner, patterns of participation and use by the learner, their satisfaction with the environment and the match of the environment with certain learner characteristics. Each of these is addressed in turn in the following sections.

2.5.1 Learner perceptions of elements of the environment

The starting point for research into a learner's use of the provided environment is to determine what a learner thinks about those elements in that provided environment. For example, Ausburn (2004) focused on what the learner considered important, getting 67 adult students to rank the eight features commonly found in online courses in order of importance to the learner. Overall course announcements, course structure and requirements (e.g. unit guide), and assessment details were ranked most highly (tier one). The second tier ranking rated course content next. The next tier comprised "convenience" features – access to the instructor and linkages to supporting material for assessment and independent study, with tier four comprising communication features. Other researchers have focused on specific features, such as Tichon, Loh and King (2004), who looked at student perceptions of a series of three-dimensional models used

to enable students to experience the symptoms and effects of schizophrenia. They found the majority (> 80%) of students agreed that the virtual reality gave them a better understanding of schizophrenia, was a valuable aid to clarification of lecture concepts, and had increased their interest in learning more about the experiences of patients with schizophrenia. Hatch (2002) focused his research even more specifically, looking at aspects of online discussion forums and student perceptions. He surveyed 127 students and found that students had some issues with discussion forums in relation to the number of postings they were required to read when class sizes increased, particularly for those with slow internet access. There was also comment on the irrelevant nature of some of the messages.

This perception of elements of the environment sets the scene for what the learner is likely to use and their level of participation in those aspects of the environment, which is addressed in the following section.

2.5.2 Relationship of elements of the environment to learner participation and usage levels

This area of research looked at participation and usage levels, as this is an area of concern amongst educators when developing environments, particularly the online environment. This research is often approached in a **comparative** way. One comparison that is made is of the more traditional face-to-face environment with the newer online environment, to determine if there are significant differences in use. For example, Burke (2001) compared the participation levels and social presence of learners using face-to-face and online group support systems. She found that both participation levels and social presence were significantly higher in the face-to-face group support system than in the distance one. She also found that perceived social presence related positively to participation in both systems, suggesting that the stronger the social presence the more likely students are to participate in using group support systems. Shroff and Vogel (2010) also did a comparative study of the face-to-face (traditional classroom tutorials) and the online (Blackboard's Virtual Classroom) environments, however they wanted to see if there was a difference in perceived learner interest as well as participation levels. They found no statistical difference in the interest of the two environments, but found

from observation, that the participation in the online environment was greater. Sometimes the comparison investigated is between two different elements in the online environment, as was the case with Hrastinski (2005), who compared the asynchronous and synchronous environments, looking at levels of student participation (class work collaboration, exchanging information about class work, socializing, and giving and receiving help) in a Business course. He found that participation levels were higher across the cohort for the asynchronous medium only when compared with the course using both media. However, for the course with both media, it was found that those who used the synchronous medium showed higher levels of participation than those who did not.

Other research has focused on **specific usage** aspects of particular elements as they are introduced into the education sector and become part of the provided learning environment. For example, Judd and Kennedy (2005) discussed a monitoring system showing the usage of a range of software applications and the Internet for the first eight weeks of a semester in the biomedical area. Web-browsers were used in almost every session (94%) and Microsoft Word was the most frequently used application, steadily increasing over the period. Specialized teaching software packages (33 of the 41 applications) were all used at least once during the period of time under study. Usage was generally low, but did increase for some of these applications after being recommended by course coordinators. The vast majority of web pages visited that were external to the university were communication sites. Email was predominant followed by social networking sites. The research continues to investigate the use of new technologies as they are introduced into the learning environment, the latest being that of mobile technologies. For example, Chmiliar (2010) investigated the use of mobile technologies: Personal Digital Assistants (PDAs), MP3 players, cell phones and laptop computers. Her cohort of students surveyed was predominantly mature age (83.6%) and female (92%). She found that the predominant mobile technology was the cell phone (91.8%), which was generally limited to basic function use (i.e. phone calls), and that the laptop was the technology most used for academic purposes.

As software technology becomes more sophisticated, a related area of research to that of investigating the use of elements of the environment has developed. This area of research focuses on the development of **automatic means of analyzing learner activity and usage** in web-based learning environments. For example, Scheuer, Mühlenbrock and Melis (2009) discussed the analysis system SIAM (System for Interaction Analysis by Machine learning) which identifies events in an interactive environment (e.g. communication between components, completion of an exercise), logging these events for later analysis. The analysis component analyzed the data through query scripts that enable the researcher to select the type of usage analysis required (e.g. student success/completion rates, number of pages read, amount of online time in an activity). Mazza and Botturi (2009) also looked at automatic usage analysis, in this case an open source, graphic student-tracking tool called GISMO that is integrated into the Learning Management System Moodle. They looked at its uses and benefits for an online case study, using it to examine students' processes and use of the environment to complete two exercises in a learning scenario. Due to a break in the tracking between the two exercises, they were able to identify an additional activity (validation of the first exercise by the teacher in the room) that aided students in the successful completion of the second exercise.

This research helps to identify general usage patterns for particular elements in the learning environment, but provides no insight into the reasons behind the use or otherwise of those elements. The next section takes a further step towards discovering those reasons by examining the satisfaction of the learner with the particular element.

2.5.3 Relationship of the elements of the environment to learner satisfaction

Learner satisfaction is another area of research done in relation to learning environments, predicated on the premise that if learners are satisfied with the environment they are more likely to engage in the use of it (Chiu, Sun, Sun, & Ju, 2007). Once again, some researchers have focused on a **comparative analysis**. For example, Johnson and his colleagues (Johnson, Aragon, Shaik, & Palma-Rivas, 2000) compared two equivalent courses, one run in a traditional face-to-face environment and the other

delivered in a totally online format, to see if there was a difference in learner satisfaction. They found that the face-to-face students had significantly more positive views for interaction, both with fellow students and the instructor, and for support, particularly in relation to instructor support and feedback. Hauck (2006) also looked at student satisfaction in an online and traditional face-to-face large introductory course in economics. Unlike Johnson and his colleagues, he found no significant difference overall between levels of student satisfaction, despite both positive and negative comments being made about the online environment.

Other researchers focused more on the **factors affecting satisfaction** within the environments. Bolliger and Martindale (2004) discussed what factors determine student satisfaction when learning online. They identified aspects of the instructor (e.g. preparation, communication, content knowledge, encouragement and teaching methods) as being the most important factor related to student satisfaction. They also found that reliable technology, particularly for communication, is important; and that learners need to have opportunities to participate in discussions so that they feel they are a member of the learning community. Drennan, Kennedy and Pisarski (2005) also found that technology aspects, in this case the perceived ease of use and access to the technology, impacted upon satisfaction when investigating flexible online learning. Other factors included the level of autonomy and innovation of the learner, with the more autonomous and innovative learners having higher levels of satisfaction. Hassett and his colleagues (Hassett, Ingram, Hassett, & Marino, 2003) approached the idea of satisfaction a little differently, using the willingness to purchase identically priced off-the-shelf web courses to gain an insight into satisfaction. They found that the significant factors influencing satisfaction were: how entertaining the course was, how well written, how attractive in appearance, and how well the course taught the materials. Correlations showed that learners preferred the more engaging and entertaining courses.

So from this type of research we see factors that relate to satisfaction as more reflective of the nature of the learner (e.g. response to encouragement from the instructor, perceived ease of use of the technology, entertainment value of the course), moving the

research closer to the reasons behind the choice of elements within a learning environment by the learner. The next section moves that investigation of the link with the learner closer still, with the research now moving towards the relationship of the elements of the environment with the learner's characteristics, which is the precursor of an investigation into the learner's own construction of his/her learning environment and the drivers that influence its construction and use.

2.5.4 Elements of the environment in relation to learner characteristics

The research that is focused on the elements of the environment and the learner characteristics (i.e. their learning style) is based on the premise that "making sure that resources are matched with learning styles can maximize the learning experience for students" (Bach, Haynes, & Smith, 2007 p. 49). This type of research, while still starting with the provided environment, links more closely to the learner than purely investigating perceptions, usage, participation levels or satisfaction with the elements of the environment. It focuses on the nature of the learner and how that nature might impact on his/her use of the provided environment. Despite being somewhat controversial (Pashler, McDaniel, Rohrer, & Bjork, 2008), one of the areas of research into the elements of the environment and learning characteristics is to determine the learner's learning style using a particular indicator, investigating the impact of the element in relation to the different groupings within that learning style. For example, Becker and Dwyer (1998) focused on **visual versus verbal** learning styles in relation to the incorporation of groupware technology (e.g. Lotus Notes) for project groups in an accounting class. They found that those with visual learning style reported that the groupware product enhanced the group's experience and helped the project run more smoothly, whereas those with a verbal style rated the effectiveness of the groupware as lower. Huang, Yoo and Choi (2008) used a different indicator, that of the **Gregorc Style Delineator** (Gregorc, 1982), which is based on the experiential learning cycle, in relation to the use of Web 2.0 applications. They found that concrete-sequential learners were the most comfortable in using online community tools and are likely to use them based on social opinions, while abstract-sequential learners had the least positive attitude towards the use of Wikis. Abstract-random learners had the highest anxiety in

participating in Second Life, while concrete-random learners felt comfortable using Second Life but had a high perceived level of difficulty in using Facebook and online video sharing. This type of research highlights the differences in learning styles of individual learners, and shows that the environment provided does not necessarily suit all types of learners, with some learners actively and enthusiastically engaging in using some elements of the learning environment that other learners use reluctantly, if at all.

Another focus of research in this area is that of the investigation of learner characteristics and technology elements of an environment using a **comparative analysis** of that element with the face-to-face environment in light of the learner characteristics. Curtis and Lawson (2001) used this approach when investigating text interactions in a collaborative online learning environment. The research looked at characteristics and behaviors that included

> the extent and depth of on-task activity (numbers of contributions and the 'depth' of those contributions), social chat, extent of collaboration, possible gender influences, mutual explanations (seeking clarification and providing information to peers), and regulatory behaviors (encouraging effort and monitoring peers' efforts and contributions)" (p. 22).

They found that the same behaviors were present both online and face-to-face, with more planning occurring online but less challenging of other's ideas when compared with face-to-face. Similarly, Diaz and Carnal (1999) investigated the distance learning environment in this comparative way, looking at social learning styles in the face-to-face and the distance learning environments. They found that those taking distance education courses rated higher on the independent learner scale than their on-campus counterparts. They suggest that this has implications for providing a learning environment that has opportunities for self paced independent study in the distance education environment, and that on-campus students would benefit from more structure and guidance.

Grasha and Yangerber-Hicks (2000) in contrast, approached their investigation of the environment with learner characteristics quite differently, looking at the teaching styles used by educators, the learning styles reinforced by these and the relationship to various technologies. The data came from the teachers' perceptions. They found that educators tended to use clusters of instructional technology types in their courses and they tended not to modify their teaching style regardless of whether they used instructional technology or not. Teachers perceived the students in non-technology based courses to be more competitive, with traditional courses showing a relationship to a more dependent learning style that was absent in the technology courses.

In this area of research we see how the characteristics of the learner (i.e. learning style, social interaction and social learning style, collaborative behaviour, gender, level of independence) relate to his/her use of elements of the provided learning environment, giving some insight into the aspects of the learner that impact on this process. Such insights are important to the educator if they are to engage their learners fully with the unit of study they are teaching, as disengagement by the learners with elements of the environment are likely to hinder the learning outcomes for the learner.

In the research into the learner's use of the provided elements we see a gradual move in the investigation of this topic area away from general learner perceptions of the provided environment, moving through general use of, participation levels for, and satisfaction with the elements of the provided environment, towards an examination of some of the learner characteristics that impact on these features. Each area of research moves a little closer to determining what influences the choices the learner makes in his/her use of the provided environment, but it does not address the construction and use of the learner's own learning environment. The next section looks at the literature associated with the learner constructed environment.

2.6 The learner constructed environment

Referring back to the model of learning environments presented in Figure 2 of this chapter on page 12 of this thesis, the literature presented so far has covered research on

learning environments directed and controlled by the educator/designer (i.e. that are external to the learner) and the use by the learner of those provided environments. The prevailing educational theory underpinning the learning environments of today, particularly those incorporating technological elements, is that of constructivism (Conole, Dyke, Oliver, & Seale, 2004), in particular social constructivism (Dasgupta, 2010; Karacapilidis, 2010). The intention of the educator/designer is to provide an environment that incorporates features that support constructivist principles. These environments, as discussed in the preceding examples, include such features as authentic, open-ended problems; document and resource sharing; communication environments that support discussion, both face-to-face and online; co-operative and collaborative workspaces that support the co-construction of knowledge; and learning spaces that enable learning to take place independent of time or place. But these areas of research only form part of the picture. The educator can provide an environment designed using appropriate pedagogies that support social constructivism, incorporating technology and artifacts as they see fit, but this does not mean that the learner will use the environment as intended. It does not mean that the learner will react with enthusiasm and fully engage with the open-ended, real life problems presented. It does not mean that the learner will make full use of the resources provided or have meaningful discussions with his/her peers. It does not mean that the learner will collaborate with his/her peers and educators to co-construct knowledge in the context of the unit of study. In short, the provision of a particular environment does not mean that the needs of the learner are being met, nor does it ensure the environment is used to achieve effective learning. As Jones and Liu (2001) indicate

> Many developers believe that when they develop effective instruction, adoption of its use will follow in time; however, this might be a false assumption. The ‘if you build it, they will come’ mentality is not a true statement when working with students who are already pressed for time and are given the option of whether or not to use the instructional medium (p. 840).

While the investigation into the use of the provided environment gives some insight into the way in which that environment is being used, it does not show why the learner incorporated certain elements of that provided environment and discarded others. Nor does it show what the learner includes in addition to the provided environment to aid his/her learning, to say nothing of the drivers behind those decisions. Rather what should be provided is an environment that provides learning tasks, conditions that encourage learning and a range of resources that the learner can select from and customize to construct his/her own unique learning environment (Goodyear, 2002; Jones, 2002). If we are to gain a better understanding of effective learning environments, "much greater acknowledgement must be given to the understandings and models that students construct for themselves during the learning process" (Ramsden, 1988 p. 22). As Tam (2000) indicates,

> if learning truly depends on the unique base of experience and knowledge brought to the learning environment by the learner, the learner then certainly should play a role in determining the learning goals, strategies, and methods for building on his or her base of knowledge and understanding (p. 57).

This includes not only what learners do and how they learn, but also how learners create and use their own learning environment. There is a need then to examine how learners construct their environments, linking the pedagogy, design, technology and learner characteristics, so that appropriate environments, stocked with appropriate resources and elements, can be provided for the learner to enable construction of his/her own learning environment, using those resources and elements as he or she sees fit.

The research in this area, then, begins with the learner. There has been limited research conducted in this area. Some have looked at the resources students have made use of, and those that have been discarded. For example, Gorsky, Caspi and Tuvi-Arad (2004) looked at what instructional resources and dialogues are utilized by students learning university Chemistry. They found communication with the lecturer and use of tutorials

more effective than studying from textbooks. They also found that students not experiencing difficulty tended to study on their own, using self-study materials rather than attending tutorials or engaging in communication with either peers or the instructor. Tutorials and peer-to-peer dialogue were employed most to overcome conceptual difficulties, with online asynchronous communication used least due to timeliness of response and difficulty writing chemistry text. Trinidad, Aldridge and Fraser (2005) also examined the learner's learning environment preferences, looking particularly at the e-learning environment. They investigated students' perceptions of their e-learning environments, looking at how well the actual environment matched their preferred environment. They developed a tool, the Online Learning Environment Survey (OLES) that had eight scales: computer usage, teacher support, student interaction and collaboration, personal relevance, authentic learning opportunities, student autonomy, equity and aspects of asynchronicity (i.e. the asynchronous nature of the discussion environment). They found that, on all scales, learners would prefer a learning environment more favourable than the one they currently have. They also found that teachers' and students' perceptions differed, with teachers finding the environment more positive than their students. Ellis (2006), by contrast, determined implications for the online environment by looking at the physical learning environment and investigating how learners constructed this environment based on the extravert/introvert and judging/perceiving dimensions of personality type as determined from the Myers-Briggs Type Indicator®. Her research found that extraverts needed comfort and space in their environment, while judging types needed structure. Introverts required personal space, while extraverts considered connection with others important. Opportunities for external creativity were important for extravert-perceiving types, while internal creativity was important for introverts. This research now focuses on the learners' innate attributes (i.e. personality type) and the impact of those attributes on the construction and use of their own learning environment, providing useful information for the use of aspects of the provided environment.

Here we see research that focuses on the learner perspective, investigating the match between the provided environment and the learners' needs, what they use and discard

from the provided environment, and to some extent, what they add to their own environment. What this research does not address are the drivers behind the choices made in the learners' construction and use of their learning environment, and how these drivers influence this construction and use.

Another area of research that has become more prominent in the last few years that recognizes the individual nature of the learner's own learning environment is that of the **personal learning environment** (PLE). Research in this area focuses on systems that are adaptive, allowing personalization through individual learning plans, social networking and mobile e-learning (Kampana, Tsolis, & Tsakalidis, 2011; Stoyanov, 2011), or those that provide a vehicle that integrates resources, services, and applications that the individual learner can access during their learning in a way that suits them (Taraghi, Ebner, & Kroell, 2012). McLoughlin and Lee (2010) approached their investigations of personalized learning environments in a different way, looking at the educator's scaffolding needed to assist students in their learning, and help them utilize a learning environment, populated with rich media resources, that is more personal, social and participatory.

While all these systems and approaches are moving towards greater emphasis on the learner taking control of the environment and adapting it to suit his/her needs, none examine the drivers that influence the construction of these personal learning environments. As Tu and his colleagues (Tu, Sujo-Montes, Yen, Chan, & Blocher, 2012) state, "if students are not clear with their learning goals and are uncertain how to appropriate relevant technologies to achieve these goals, an effective PLE would not occur at all" (p. 14).

2.7 Conclusion

We can see in this review that constructivism, both individual and social, plays a role in the design, development and implementation of provided learning environments, whether it is in the underlying focus of the development of the learning environment through the pedagogical approach, whether it is contained through aspects of design of the environment or whether it is through the inclusion of specific elements that support

constructivist principles. The driving feature of constructivism is the emphasis on the learner constructing his/her own representations of knowledge, either individually or with others (Schunk, 2004), which, it would seem, would require a similar construction of his/her learning environment to support that construction. Yet what we see predominantly in the literature is a focus on the educator/designer perspective. Larochelle and Bednarz (1998) remark on this educator focus commenting that a "softer" view of constructivism is often adopted with the impact that

> taking students' knowledge into account seems to have scarcely modified the usual teaching modus vivendi at any level of instruction one chooses to examine. No doubt students' points of view are elicited with greater frequency. That is, in fact, the major effect of so-called constructivism on educational practices ... However, such elicitation appears to obey no other end than to identify 'what's wrong' with the students' point of view. Wrong, that is, from the perspective of the knowledge which is to be taught; no account is made of how potentially this sanctioned form of knowledge may present major divergences with student knowledge in terms of nature, scope, and viability (p. 3).

This limited view of the role of the learner's viewpoint in constructivism flows into the research on learning environments with the emphasis on the provided environment, and the sense that because the academic and/or designer sets up an environment for a unit it must be the "right one" for what is to be taught. The research that examines the learners' use of the provided environment is a move towards the recognition of a more learner-centered approach, and the last section of the literature review takes this one step further by viewing the learning environment from the learner's perspective. There is a need to move the research a further step to examining, not only how a learner constructs his/her learning environment, but also what drives that process, which is the focus of the research presented in this thesis.

It is in this context that the research questions for this study were formulated, as presented earlier in Section 1.5. They are repeated below:

1. What are the needs and characteristics of the learner, and the influences (both internal and external) on the learner, that impact on the construction and use of his/her learning environment?
2. How do these needs, characteristics and influences impact on the learner's learning environment in terms of its construction and use?

3 Chapter Three – Methodology

3.1 Overview

This chapter outlines the research design and methodology used to investigate the influences, needs and characteristics that impact on a learner's construction of his/her learning environment. The chapter begins with a brief description of the research problem and the motives and goals for the investigation; the research questions that address the problem; the research strategy chosen and the justification for that choice; and the ontological and epistemological perspectives and assumptions associated with the research questions and the research strategy. It then outlines the particular research paradigm used, the methodology employed that fits within the research paradigm and the reasons behind the choice, as well as the data sources selected and the justification of those sources. The data collection is presented, providing a description of each of the units involved in the study, the learners enrolled in the units that participated in the study and the two data collection methods – that of a semi-structured interview and the MBTI®. The chapter then continues with a description of the data analysis using grounded theory as the main analytical technique. Prior to the conclusion of the chapter the validity of the study is discussed together with issues and limitations associated with the research strategy and design.

3.2 Research problem and the motives and goals for investigating it

Research into learning environments has focused mainly upon the learning environment as envisaged by the educational designer or as constructed and used by the educators (see Chapter Two of this thesis). There is a need to investigate learning environments from the learner's perspective in order to complete the picture related to learning environments. This includes determining what influences the construction and use of such a learning environment and how these influences affect this construction and use.

3.3 Research questions

The study had one stage of data collection, with two research questions. The two research questions were:

1. What are the needs and characteristics of the learner, and the influences (both internal and external) on the learner, that impact on the construction and use of his/her learning environment?
2. How do these needs, characteristics and influences impact on the learner's learning environment in terms of its construction and use?

3.4 Research strategy

This section looks at the research strategy chosen to investigate and answer the research questions, the ontological and epistemological assumptions and perspectives arising from the particular research strategy and the nature of the research questions, the research paradigm that is consistent with the research strategy, and the methodology used within that research paradigm.

3.4.1 Abductive research strategy

The focus of this research study is to investigate learning environments from the learner's viewpoint, aiming to discover what needs and characteristics of the learner, and what influences (both internal and external) impact on the construction and use of the learner's environment and how this is manifested. To gain an in-depth understanding of this process, the Abductive research strategy (Blaikie, 2007; Hartshorne & Weiss, 1960) has been used. "The starting point [of this strategy] is the social world of the social actors being investigated: their construction of reality, their way of conceptualizing and giving meaning to their social world" (Blaikie, 2009, p. 19). This fits well with the need to use a research strategy that looks at the participants' viewpoints, that is, the learners' own descriptions of their learning environments, in order to find out what impacts on the construction and use of these learning environments and to gain an understanding of how this is done. As Blaikie (2009) says "Such research begins by describing these activities and meanings and then deriving from them categories and concepts that can form the basis of an understanding of the problem at hand" (p. 89).

This is the exact nature of this study – to describe the construction and use of the learners' learning environment from the learners' perspective, deriving what influences this construction and use, and using these categories of influence (i.e. drivers) to determine how these affect this construction and use of the learners' learning environment. The first stage of this research strategy is to understand how the learners view their learning environment, examining their understandings, meanings and motives for the construction and use of their learning environment, using the language of the participants. This is achieved through an in-depth interview process of a range of participants, as described later in this chapter (see Section 3.6.3 Interviews). The next stage of the strategy is to attempt to determine categories of influences, needs and characteristics that impact upon this construction and use of the learning environment. This is achieved through analysis of the transcripts of the interviews, as described in Section 3. 7 – The analysis phase, later in this chapter.

Thus the Abductive strategy was determined to be the best approach to use for this research. As Blaikie (2009) says

> the Abductive strategy involves developing descriptions and constructing theory that is grounded in everyday activities, and/or in the language and meanings of social actors. It has two stages:
>
> - Describing these activities and meanings; and
> - Deriving categories and concepts that can form the basis of an understanding of the problem at hand. (p. 93)

3.4.2 Ontological and epistemological assumptions and perspectives

The Abductive research strategy is based upon certain ontological and epistemological assumptions. As Mason (2002) suggests, when establishing a research strategy it is necessary to examine the ontological and epistemological perspectives in relation to the research questions. These perspectives need to be examined so that they are seen to be consistent with the ontological and epistemological assumptions of the research strategy that is to be used.

The ontological perspective looks at the nature of the reality to be investigated. For these research questions, the ontological perspective for this study focuses on the individual's understandings and interpretations within the formal learning structures of his/her own environment. It is the unique individual interpretations of the particular phenomenon (i.e. the construction and use of the learning environment) for that learner that are under study – not the determination of all the unique variations of the phenomenon, but the identification of aspects that help distinguish qualitatively different ways of experiencing that phenomenon (Åkerlind, 2005). The ontological assumption associated with the Abductive research strategy is the Idealist ontology. This assumption indicates that:

- Reality consists of representations that are the creation of the human mind.
- Social reality is made up of shared interpretations that social actors produce and reproduce as they go about their everyday lives.
- … constructions of reality are regarded as different (multiple) perspectives on an external world. (Blaikie, 2009, pp. 93 - 94)

There is a consistency between the ontological perspective that the research questions relate to and the ontological assumptions upon which the research strategy is based: that is, the focus on individual interpretations of the social actors (i.e. the learners), of their reality (i.e. their construction and use of their learning environment).

The epistemological perspective focuses on what representations of knowledge or evidence are appropriate, with reference to its limits and validity, in order for the research study to answer the research questions. In this study it is the individual's account of his/her understandings and perspectives of the construction and use of his/her own unique learning environment that provide this knowledge and evidence. In order to gain this knowledge and evidence it is therefore necessary to question those individuals about their understandings and perspectives, making the semi-structured interview the

most appropriate method of collecting such data. It is also necessary to give these participants a particular environment to describe; hence the data are collected from participants formally enrolled in a tertiary unit of study. These descriptions, however, are not enough. It is necessary to take these descriptions, of which each one is a unique interpretation for that individual learner, and identify common categories that help make sense of this knowledge and make it useful as educational research. This is consistent with the epistemological assumption that is the basis of the Abductive research strategy, that of Constructionism, which states that:

> Everyday knowledge is the outcome of people having to make sense of their encounters with the physical world and other people, and social scientific knowledge [or educational knowledge in this case] is the outcome of social scientists [or the educational researchers] reinterpreting this everyday knowledge into technical language. (Blaikie, 2009, p. 95)

Once again, there is a consistency between the epistemological perspective that is used to determine the representations of knowledge that enable the researcher to answer the research questions, and the epistemological assumptions upon which the research strategy is based: that is, that the individual learner's descriptions are collected as representations of the knowledge of the learners' environments, and then re-interpreted to provide answers to the research questions posed.

3.4.3 Research paradigm and methodology

This research study used the Interpretivist research paradigm. Radnor (2001) indicates that

> the interpretive approach rests on the premise that in social life there is only interpretation. Everyday life revolves around persons interpreting and making decisions about how to act based on their own experiences and their interpretation of the experience and behaviour of others. The purpose of interpretive research is to clarify how interpretations and

> understandings are formulated, implemented and given meaning in lived situations (p. 4).

As the study is investigating the learner's perspective of his/her learning environment, it is the learner's interpretation based on his/her own experiences that influence the construction and use of his/her own individual learning environments that is under investigation in this study. Therefore it is appropriate to use a paradigm that supports the investigation of these reasons, characteristics and drivers that have influenced the construction and use of each learner's own particular learning environment. This is also consistent with the Abductive research strategy, which focuses on the social actors (i.e. the learners in this study) and their construction of reality (i.e. their learning environments).

Within this paradigm a phenomenographic research methodology has been used. The purpose of any research is to gather information that enables the investigator to answer one or more research questions. In this research the information being gathered relates to a particular phenomenon – that of the learner's learning environment, with the broad aim of exploring this environment from the learner's perspective to determine what impacts on its construction and use. Marton (1986) defines phenomenography as "a research method adapted for mapping the qualitatively different ways in which people experience, conceptualise, perceive, and understand various aspects of, and phenomena in, the world around them" (p. 31). Bowden (2000) describes two types of phenomenographic research methodology. The first is that of 'pure' phenomenographic research

> which focuses on the phenomenon under study per se and where the ultimate goal is to develop full descriptions of the range of ways of experiencing that phenomenon, with no intention of using those outcomes to effect change (p. 5).

The second is that of ‘developmental’ phenomenographic research which

> seeks to find out how people experience some aspect of their world, and then to enable them or others to change the way their world operates, and it usually takes place in a formal educational setting (p. 3).

This research sits somewhere in between these two types. The focus on the learners’ conceptualization and understanding of their learning environment in terms of its construction and use is more closely allied to ‘pure’ phenomenography. The research does, however, take place within the formal tertiary university educational setting, and the discussion of the findings of the study relate the interpretations of the learners’ learning environment to other aspects of learning environments such as pedagogy and learning environment design, hence also allying the research with that of ‘developmental’ phenomenography. This research methodology is consistent with the Abductive research strategy, not only by exploring the individual participant’s experience of their learning environment, but by endeavouring to identify categories that influence this construction and use.

3.5 Data sources

As part of the research design, each research question was examined to determine the data sources required.

Interviews were conducted with students enrolled in tertiary coursework study (see Sections 3.6.1 and 3.6.2 for details of the unit selection and participant sampling respectively). These data, together with the personality type of each participant as determined by the Myers-Briggs Type Indicator® (MBTI®), were used to answer the first research question: What are the needs and characteristics of the learner, and the influences (both internal and external) on the learner, that impact on the construction and use of his/her learning environment? Interviews were chosen as the means to gain an account of each learner’s own learning environment as it had been constructed and used (see Section 3.6.3 for further details about the interviews), and the MBTI® was

chosen as it provided a mechanism for assessing personality type that relates directly to learning (see Section 3.6.4 for further details about the MBTI®).

Table 1: The research questions showing the data sources and their justification

Research Question	**Data sources**	**Justification**
1. What are the needs and characteristics of the learner, and the influences (both internal and external) on the learner, that impact on the construction and use of his/her learning environment?	• Interviews of students enrolled in tertiary coursework study. • Personality type of participants as determined by the MBTI®	Interviews provide the learners' accounts of their learning environment as it has been constructed and used. This provides a mechanism for assessing personality type that relates directly to learning.
2. How do these needs, characteristics and influences impact on the learner's learning environment in terms of its construction and use?	• Information about the provided environment of the unit supplied by the lecturer of the unit • Interviews of students enrolled in tertiary coursework study	The unit information provides the baseline information about the unit that is the starting point for the individual learner's learning environment. Interviews provide the specifics for the individual learning environment construction and use

Details of each unit's provided learning environment, together with the interviews of students enrolled in tertiary coursework (as outlined for the first research question) were used to answer the second research question: How do these needs, characteristics and influences impact on the learner's learning environment in terms of its construction and use? The details of each unit's provided learning environment were obtained from the lecturer in charge of the unit, and were used to provide the baseline information that is the starting point of the construction of each individual learner's learning environment

(see Section 3.6.1.1 – 3.6.1.5 for the descriptions of each unit's provided learning environment). The interviews of the learners provided the specifics of each individual learner's learning environment.

Table 1 shows a summary of the data sources and their justification for using these, for each of the two research questions.

3.6 Data collection

3.6.1 Unit selection

The units the participants were enrolled in were selected from Australian universities using four main criteria as follows:

1. That the units offered a range of different discipline areas within the tertiary university sector. These included those that had a Scientific or Technology focus (i.e. Technology for Education and Psychopathology), those that had an Arts/Humanities focus (i.e. Indonesian) and those with an Education focus (i.e. Child Development and Integrated Curriculum).
2. That the units used a range of different modes of delivery, which included fully distance education, a mixture of distance education and on-campus modes, on-campus but fully online and on-campus with some online components.
3. That the units offered a range of technology-supported and online elements as well as the more traditional elements.
4. That the units provided some difference in pedagogical approach. This included the traditional lecture tutorial structure, problem-based learning and independent study supported by a residential component.

The request for a unit to be included in the study was sent through the HERDSA (Higher Education Research and Development Society of Australasia) and ASCILITE (Australasian Society for Computers in Learning in Tertiary Education) membership email lists, and a number of lecturers responded as willing to participate. Two universities responded – both from regional areas. Two lecturers from a third metropolitan university were approached directly as their units added the variety in

pedagogical approach needed for the study. A description for each unit was provided by the lecturer of the unit and is shown as follows.

3.6.1.1 Indonesian

This unit ran over a thirteen-week semester and could be taken in either on-campus or distance mode. The on-campus mode had a one hour lecture on Indonesian culture and one on the spoken language, with two hours of tutorial covering grammar and language practice each week. The distance mode had a weekend day-residential around week seven of the semester. Both groups had a printed study guide and online access to a Learning Management System WebCT Vista site (referred to as the MUSO site). This provided a calendar of events, lecture materials (in downloadable format), a number of references and links to useful Indonesian web sites, weekly tasks, email access, an asynchronous discussion forum in Indonesian only, and an English/Indonesian asynchronous forum for discussion and assignment submission. Optional online synchronous chat sessions were also scheduled. The students were also provided with a CD-ROM. This had a series of topics with written material, tasks and aural examples of Indonesian that students could use as a play-back practice environment. As part of their assessment, students were required to submit one of the online weekly tasks to the English/Indonesian forum for discussion, as well as completing written and oral assignment and an oral and written examination.

3.6.1.2 Child Development

This unit was an on-campus unit run over a thirteen-week semester. It followed a problem-based learning (PBL) approach, where students formed groups of five to work through a series of staged scenarios, the central focus being a pre-school aged child. Each member of the group took a different role in relation to the child, and had an individual assessment item in relation to their role, as well as a group assignment. The students attended one weekly lecture (from one to two hours in length) and had a two-hour face-to-face tutorial each week for their group work related to the scenarios. There was a set textbook for the unit, together with a WebCT Vista site (MUSO site) where students could download lecture slides and access links to various useful information and references. Through the site, each role had its own asynchronous forum (accessible

to the whole class), where students were required to post a minimum number of messages for their role. There was also an optional synchronous chat environment.

3.6.1.3 Psychopathology

This unit of study took the form of the more traditional distance learning approach and ran over a twelve-week semester. Students were provided with a printed study guide outlining the unit, together with suggested readings. There was also a textbook for the unit. Students attended a one-week residential, which occurred in week eight of the semester. During the residential, students attended face-to-face lectures and presented on a topic of choice for one of their assignments. An optional asynchronous forum was also provided. Students completed a presentation, an essay assignment and an exam for their assessment.

3.6.1.4 Technology for Education

This unit was a first-year undergraduate unit for Education students and could be taken in on-campus mode or fully online, although the majority of students were on-campus students. The unit ran over a twelve-week semester. Students were provided with a WebCT site that included an asynchronous discussion forum set up as separate discussion topics, an online synchronous chat room, online quizzes, an assignment submission drop box, email and links to various resources. The face-to-face classes were optional. Students completed assessment tasks each week, and also had an online quiz and e-Forums they were required to participate in (both asynchronous and synchronous).

3.6.1.5 Integrated Curriculum

This unit was a fourth-year undergraduate unit for Education students and was an on-campus unit with some online technology components. The unit was a compulsory unit and ran over a twelve-week semester. The unit had one three-hour face-to-face class each week, which comprised a combination of lectures and associated face-to-face group activities. Students were also provided with a WebCT site, which incorporated an online asynchronous discussion forum set up as separate discussion topics, an online synchronous chat room, email and links to various resources such as other web sites and readings, and weekly interactive tasks. Students completed weekly online assessment

tasks (e.g. participate in an online discussion, review a paper) and a group assignment for their assessment.

3.6.2 Participant sampling

Once the units had been selected to be included in the study, the researcher sought ethics clearance for the study. This included clearance from the supervising universities as well as each of the universities whose units were included in the study (see Appendix A for the ethics and university clearance documents). On obtaining this clearance, the researcher attended a lecture for each of the units to request participation of students in the study. A brief outline of the research study, as well as the aspects of the study requirements (i.e. an audio-taped interview and completion of the Myers-Briggs Type Indicator questionnaire) were given to the full student cohort attending the lecture (see Appendix B for explanatory statement).

Table 2: Breakdown of participants, showing gender, and on- or off-campus study mode

Unit	**Number of participants**	**Male**	**Female**	**On-campus**	**Off-campus**
Integrated Curriculum	10	1	9	10	0
Child Development	5	2	3	5	0
Psychopathology	10	4	6	0	10
Indonesian	6	1	5	4	2
Technology for Education	2	1	1	2	0
Total	33	9	24	21	12

Once participants had indicated their willingness to participate in the study, they were briefed as a group more fully by the researcher. This included providing an informed consent form to complete (see Appendix C for the informed consent) and the preliminary briefing for completion of the MBTI®, which was to be completed in their own time. They were given the MBTI® question set and answer form, and asked to bring the completed form to the interview.

Thirty-five students responded. These were interviewed and asked to complete the MBTI® questionnaire. There was an issue with the audio taping of the interviews for two participants, making them unable to be transcribed, thus these participants were excluded from the data. Table 2 gives the number of participants, showing their unit enrolment, gender and on- or off-campus status of enrolment.

3.6.3 Interviews

One semi-structured interview of approximately one hour in duration was conducted with each of the thirty-three participants. These were conducted at a university location convenient to the student and at a time convenient to both parties. They were recorded on audio-tape and subsequently transcribed by the author.

As can be seen from Table 1 (research questions and their related data sources and justification – page 66 of this thesis), these semi-structured interviews provided the primary data content for the study. Seidman (1998) indicates that "at the root of in-depth interviewing is an interest in understanding the experience of other people and the meaning they make of that experience" (p. 3). This is the intention of this study – to understand the experience of the learner and the meaning he/she makes of the construction and use of his/her learning environment. Schutz (1967) indicates that the meanings of a particular action (in this case the construction and use of the learner's learning environment) is provided by the person carrying out that action, that is their "subjective understanding", making the interview an appropriate vehicle to gain these meanings.

This intention also sits well with the interpretivist paradigm used for this research. As Mason (2002) states

> What is distinctive about interpretive approaches, however, is that they see people, and their interpretations, perceptions, meanings and understandings, as the primary data sources. Interpretivism ... can happily support a study which uses interview methods for example, where the

> aim is to explore people's individual and collective understandings, reasoning processes, social norms, and so on (p. 56).

As this is exactly the nature of this research, that of gaining the learners' particular perspectives on their construction and use of their own learning environment, the interview was employed as the primary data source.

When interviews as a data source are considered in relation to the phenomenographic methodology, it is necessary to consider the focus of phenomenography: that of "investigating variation in understandings of the same phenomena" (Åkerlind, 2005, p. 64). The interview provides an opportunity, as Bowden (2000) says, "to get interviewees to reflect on what they have expressed, to explain their understanding more fully and to reveal their way of understanding the phenomenon" (p. 10). The use of open-ended questions such as "What is your understanding of the aims and objectives of the unit?", "What elements were provided for you to use within the unit?" and "How did you make use of the asynchronous discussion forum?" provided an opportunity for the participant to express his or her view of the situation, thus enabling variations in description of the learning environment, as conceived by each individual interviewed, to be obtained. This was further supported by the researcher providing no information to the participants about the unit lecturer's intended use of the various elements. The interviews focused on the learners' ways of using the elements of the learning environment through their own perceptions and understandings of that element. The follow-up questions to "what" they had included in their learning environment were centered around "why" a particular element was included in their learning environment and "how" it was used as part of their environment. These types of questions are essentially phenomenographic in nature as they provide a way of exploring the participant's thoughts about, and experience and understanding of, the phenomenon (i.e. their learning environment). This information enabled analysis of this construction and use to identify the drivers employed by the learners that orchestrated this process.

Four main themes were covered by the interviews: background information, the learner's learning environment, conceptual aspects of the learner's learning environment, and the learner's approach to learning. Each of these is explored in more detail below.

3.6.3.1 Background information

For any study that relies on understanding the perspective of the interviewee, there is a need to set the context of that participant in relation to the study. As Seidman (1998) states, "The interviewer's task is to put the participant's experience in context by asking him or her to tell as much as possible about him or herself in light of the topic up to the present time" (p. 11). Here we are endeavouring to find out about the learners' understanding of the unit they are enrolled in and where they see themselves fitting into that context in order to construct and use their learning environment for that unit. Questions were included to determine the learner's understanding of the aims and objectives of the unit and their knowledge of the unit prior to commencing the unit. They were also asked to provide information about their reasons for taking the unit (if not compulsory) and what they saw as their responsibility in the unit, including responsibility to themselves, the other students and the development of the unit.

3.6.3.2 The learner's learning environment

In order to get a sense of the construction and use of the learner's learning environment, the participants were first asked questions about the learning environment provided with the unit. While the lecturer of the unit had provided information about this, it was also necessary to establish this from the participant's perspective, as this would influence the overall construction of their own environment. This provided environment was explored, not only in terms of describing those elements, but also in terms of the learner's use of those elements. Once this had been established, questions relating to elements added by the participant to his/her environment were asked. This provided information about those aspects of the learner's learning environment that the learner deemed necessary in addition to those provided with the unit. It also included aspects of integration of the provided environment and the additional elements the learner added to construct the learner's own environment. By doing this it is possible to gain a sense of

the whole of the learner's learning environment and how it works to facilitate learning. As Seidman (1998) comments, the aim here is to

> concentrate on the concrete details of the participant's present experience in the topic area of the study. ... We do not ask for opinions but rather the details of their experience, upon which their opinions may be built (p. 12).

Similarly, Åkerlind (2005) states that

> in phenomenographic interviews, we are trying to elicit underlying meanings and intentional attitudes towards the phenomenon being investigated. Typically, we do this through exploring concrete examples of the phenomenon provided by the interviewee. … using them as a medium for exploring the way in which the interviewee is thinking about or experiencing the phenomenon, that is, those aspects of the phenomenon that they show awareness of (p. 65).

So the learning environment description built by the participant for his/her own learning environment provides the example upon which the opportunity to explore conceptual meaning, attached to aspects of the construction and use of the environment, is built. This is pursued in the next two sets of questions.

3.6.3.3 Conceptual aspects of the learner's learning environment

Here the focus was encouraging the participants to express the construction and use of their learning environment using a conceptual framework. The key word here was that of 'learning' being central to the construction and use of such an environment. This required questions about the nature of the environment that facilitated learning. The questions developed under this theme were informed by the work of Goodyear (2002). He defined networked learning as "learning in which communications and information technology (C&IT) is used to promote connections between one learner and other learners, between learners and tutors, between a learning community and its learning

resources" (Goodyear, 2002, p. 56), so an environment that supports such learning is one that incorporates both the network of learners and teachers as well as the technology network over which the communication takes place. He went on to describe his educational design problem-space for this type of learning as having three aspects centered around learning as the focus of the learning environment. These three aspects are community, activity and place – the communication between the learner and his/her peers, tutors and lecturers; the learner's activity; and the physical and virtual worlds in which the learner's learning environment is situated. Each of these three aspects was investigated in the interviews as follows.

For the community aspect, Goodyear (2002) states that

> learning is situated – both socially and physically. The learner's cognitive activity will be influenced by interaction with their peers and teachers. Moreover their approach to learning, their experience of learning and their sense of self as a learner and as a competent person will be influenced strongly by their social and cultural setting (p. 65).

Interview questions that addressed this aspect covered such areas as the purpose of communication for the learner in the unit, the forms of communication he/she used, which he/she preferred and why, the impact of peer-to-peer and student-teacher communication, his/her use of communication technologies and level of connectedness in the online environment.

For the activity aspect, Goodyear (2002) states that "seeing learning as a process of guided construction of knowledge means that we have to pay close attention to the learner's activity" (p. 65). Interview questions that addressed this aspect covered areas such as the types of activities the learner preferred and why, and the resources used, either provided or added by the learner, in relation to those activities.

For the place aspect, Goodyear (2002) states that

> physical setting is also important, especially when we are thinking about learning that is aided by technologies of one kind or another. The tools and other resources available will influence learning (pp. 65 - 66).

Here it is necessary to ask questions about both the physical and virtual worlds. The interview questions that addressed this aspect covered such areas as the nature of the learner's physical learning environment; the learner's view of, and attitude towards, the online environment; and the integration of the physical and virtual worlds in his/her learning environment.

3.6.3.4 The learner's approach to learning

As learning is central to the construction and use of the learner's learning environment, it was necessary in the interviews to explore the learner's approach to their learning, in terms of their innate learning styles, their learning preferences and the strategies they employed to achieve their learning outcomes. Questions included how the learner preferred to learn; what process they used to complete assignment work; what affected their learning approach (e.g. whether the environment was face-to-face or online, the difficulty level, their level of interest in the unit's content, the pedagogical approach to the unit, the assessment requirements of the unit); and how well the learner felt the pedagogical approach of the unit matched his/her preferred way of learning.

3.6.4 The Myers-Briggs Type Indicator®

The second source of data for the study was the personality type of the learners participating in the study, as identified by the Myers-Briggs Type Indicator® (MBTI®). Because learners construct and use their own learning environment to facilitate their learning, one of the aspects of a study that investigates this construction and use should include the learning preferences of the learner and the strategies associated with those preferences. For this study the MBTI® was chosen to provide a measure of the learner's stable learning preferences. The MBTI® was developed by Isabel Briggs Myers and Katharine Cook Briggs, in order to present, in an understandable and usable way, the Swiss psychologist Carl Jung's theories about personality type. Jung determined that

there were two main mental activities employed in everyday life – that of taking in new information (or perception) and deciding or coming to conclusions about that information (Myers & Myers, 1995). Keefe (1987) states that "each learner has preferred ways of perception, organization, and retention that are distinctive and consistent" (p. 7), and that a second dimension of these preferences "encompasses those aspects of personality that have to do with attention, emotion, and valuing" (Keefe, 1987, p. 9). Personality type as identified using the Myers-Briggs Type Indicator® (Myers & Myers, 1998), fits well with this concept of learning preferences as it is based on the difference between

> the way people perceive and the way they make judgments. Perceiving here is understood to include the processes of becoming aware of things, people, occurrences and ideas. Judging includes the processes of coming to conclusions about what has been perceived (Myers & Myers, 1995, p. 1).

Thus the MBTI® personality types provide a way of determining learning preferences that fall into both cognitive (ways of perceiving the world) and affective (ways of making decisions) categories, which may impact on the construction and use of the learner's learning environment.

3.6.4.1 The four dimensions of personality type

As indicated above, the way people perceive information, and the way they come to conclusions about that information, determine how people behave – that is, what they observe and what they do about it.

For the perceiving function, there are two ways of achieving this process, either directly through the senses (Sensing - S) or indirectly through the association of ideas and the possibilities they present (Intuition - N). For the decision-making or judging function, a person will use either objective decision-making based on logic (Thinking - T) or subjective decision-making based on personal values (Feeling - F).

Two further dimensions complete the personality typing. The third function indicates the nature of a person's relationship to the outer world. Those with a preference for Extraversion (E) will focus their attention, and gain their energy from, the outer world of people and things, while those with a preference for Introversion (I) will focus their attention, and gain their energy from, their own inner world of thoughts and ideas. The fourth function indicates how a person interacts with the world, whether by perceptive methods (i.e. showing their perceiving process (Perceiving - P) of sensing or intuition), or by judging methods (i.e. showing their decision-making process (Judging - J) using thinking or feeling mechanisms) (Myers & Myers, 1995). These four dimensions, each with their two alternatives, are outlined in Table 3.

Table 3: The four dimensions of personality type

Dimension	Explanation	Dichotomy	Explanation
Perceiving	The way a person takes in information	Sensing (S)	Perception gained directly through the senses
		iNtuition (N)	Perception gained indirectly through the association of ideas and the possibilities they present
Judging	The way a person makes decisions	Thinking (T)	Objective decision-making based on logic
		Feeling (F)	Subjective decision-making based on personal values
Relationship to the outer world	Where the person gets his/her energy from	Extraversion (E)	Focus of attention, and energy gained from the outer world
		Introversion (I)	focus of attention, and energy gained from their own inner world
How the person interacts with the world	Whether a person shows his/her perceiving or judging process to the outer world	Judging (J)	Show their decision-making process to the outer world
		Perceiving (P)	Show their perceiving process to the outer world

From this arises one of sixteen personality types made up of four letters representing one of the two aspects of each of the four functions. These are summarized in Table 4 (adapted from Figure 4.1 in the MBTI® Manual (Myers, McCaulley, Quenk, & Hammer, 1998, p. 36)).

Table 4: The sixteen personality types table

	Sensing	*Sensing*	*Intuition*	*Intuition*	
Introversion	ISTJ	ISFJ	INFJ	INTJ	*Judging*
Introversion	ISTP	ISFP	INFP	INTP	*Perceiving*
Extraversion	ESTP	ESFP	ENFP	ENTP	*Perceiving*
Extraversion	ESTJ	ESFJ	ENFJ	ENTJ	*Judging*
	Thinking	*Feeling*	*Feeling*	*Thinking*	

3.6.4.2 Dominant and secondary functions

A personality type will have a dominant and a secondary function of either perceiving (S or N) or judging (T or F), one of which will be extraverted and the other introverted. If the dominant function is one of Perceiving the secondary function will be one of Judging. Conversely, if the dominant function is one of Judging, the secondary function will be one of Perceiving. If the dominant function is Extraverted the secondary function will be Introverted. Conversely, if the dominant function is Introverted, the secondary function will be Extraverted. Which function is dominant will depend on whether the person is an Extravert or Introvert combined with their J/P dimension. Extraverts will show their dominant function to the outer world, so the J/P dimension indicates this function (J for a judging function and P for a perceiving function). For example, a type that has Extraversion combined with the P dimension (e.g. E—P) will have either Sensing or iNtuition as their extraverted dominant function, and either Thinking or Feeling as their introverted secondary function. Therefore an ENTP (Extraverted iNtuition with Introverted Thinking) personality type has a dominant function of iNtuitive perception and a secondary function of Thinking judgment. An Introvert will, however have their dominant function used internally, and hence will show their secondary function to the outer world. For example, a type that has Introversion combined with the P dimension (e.g. I—P) will have either Thinking or Feeling as their dominant function and Sensing or iNtuition as their secondary function. Therefore an

ISFP (Introverted Feeling with Extraverted Sensing) personality type has a dominant function of Feeling judgment and a secondary function of Sensing perception. Table 5 describes the 16 personality types in terms of their dominant and secondary functions.

The form M (Myers & Myers, 1998) used in this study to determine the participant's personality type has a co-efficient alpha score of .91 for E-I dimension, .92 for S-N dimension, .91 for T-F dimension and .92 for J-P dimension, making the MBTI® highly reliable for the individual dichotomies.

Table 5: The 16 personality types showing dominant and secondary functions

Personality Type	**Dominant Function**	**Secondary function**
ISTJ	Introverted Sensing	Extraverted Thinking
ISFJ	Introverted Sensing	Extraverted Feeling
ESTP	Extraverted Sensing	Introverted Thinking
ESFP	Extraverted Sensing	Introverted Feeling
INTJ	Introverted Intuition	Extraverted Thinking
INFJ	Introverted Intuition	Extraverted Feeling
ENTP	Extraverted Intuition	Introverted Thinking
ENFP	Extraverted Intuition	Introverted Feeling
ISTP	Introverted Thinking	Extraverted Sensing
INTP	Introverted Thinking	Extraverted Intuition
ESTJ	Extraverted Thinking	Introverted Sensing
ENTJ	Extraverted Thinking	Introverted Intuition
ISFP	Introverted Feeling	Extraverted Sensing
INFP	Introverted Feeling	Extraverted Intuition
ESFJ	Extraverted Feeling	Introverted Sensing
ENFJ	Extraverted Feeling	Introverted Intuition

3.7 Data analysis

The data analysis for this study comprised three phases as shown in Figure 3.

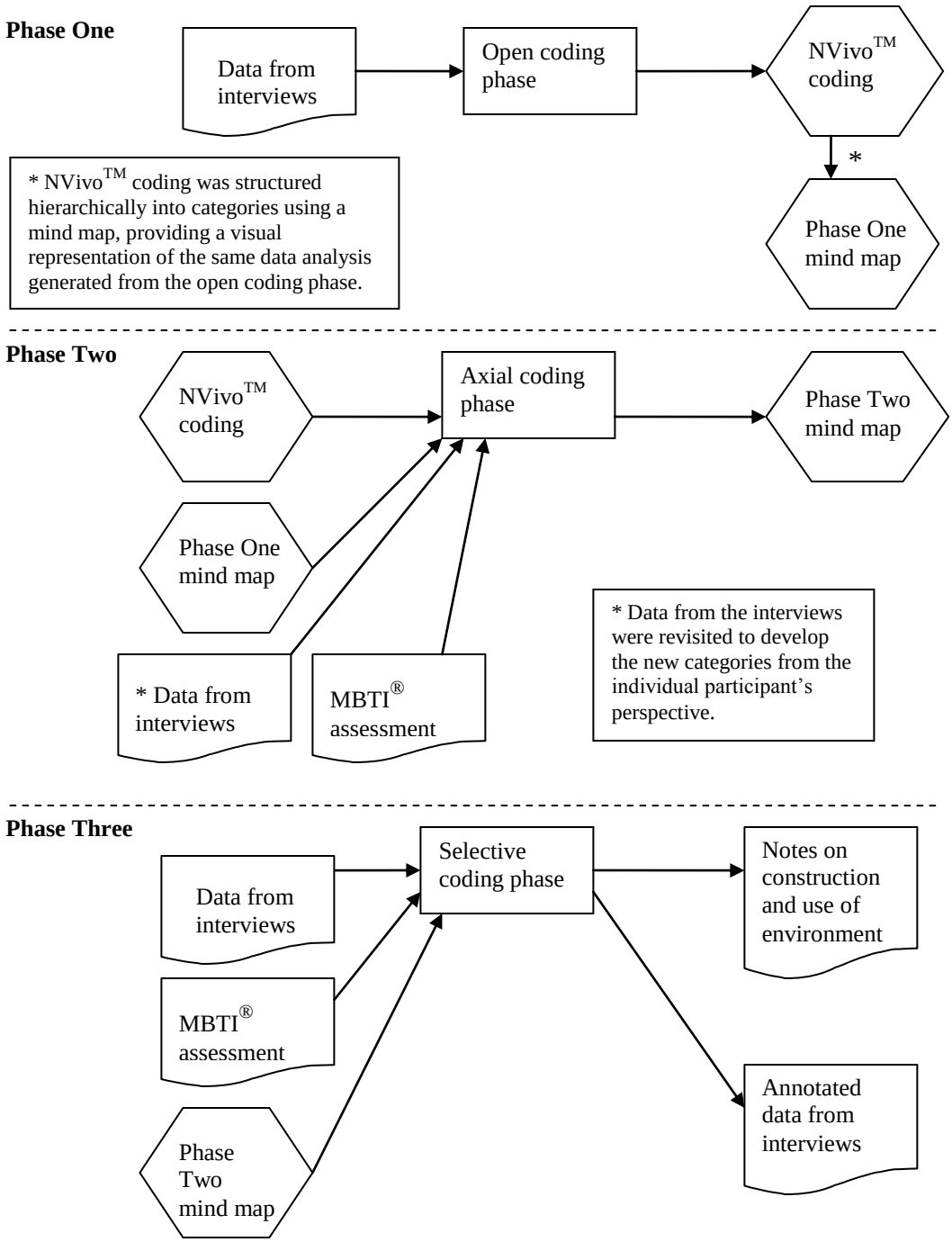


Figure 3: Chart showing the three phases of the data analysis

The approach used in the data analysis was that of grounded theory, an approach to qualitative data analysis that enables a theoretical formulation to be developed

> that is inductively derived from the study of the phenomenon it represents. That is, it is discovered, developed, and provisionally verified through systematic data collection and analysis of data pertaining to that phenomenon … One begins with an area of study and what is relevant to that area is allowed to emerge (Strauss & Corbin, 1990, p. 23).

A specific set of coding procedures are used in order to ensure the applicability of the theory to the data and provide precision and rigor to the analysis process while allowing creativity "that enables the researcher to ask pertinent questions of the data and to make the kind of comparisons that elicit from the data new insights into phenomenon and novel theoretical formulations" (Strauss & Corbin, 1990, p. 31).

3.7.1 Phase one – open coding phase

Phase one of the data analysis was that of the open coding phase. Open coding involves the attachment of conceptual labels to the data that relate to the research questions being asked, and the subsequent categorization of the data. In this study conceptual labels that described the structure of the environment, as well as the issues, needs or characteristics that impacted on the learning environment, were identified and attached to the data. To facilitate this process, two software packages were used: the qualitative data analysis application NVivo™ and the mind mapping software application Mindmanager™. This ensured that all aspects of the data had been examined and appropriately addressed in terms of not only the structural aspects of the learning environment (i.e. the nature of the constructed environment and the incorporation of the various elements in both the physical and virtual world), but also the conceptual aspects of the environment that were demonstrated by those influences and characteristics that the analysis was intended to identify.

NVivo™ facilitated the conceptual labeling of the interview transcripts and the categorization of these concepts using "tree-nodes". Table 6 shows a sample of some of the tree nodes generated in NVivo™ that represent the conceptual labels. Missing nodes are indicated by "…" in the table. It should be noted that only the main node and first level of subordinate node have been shown here. Some nodes had three or four

subordinate nodes. As can be seen here, these labels cover the structural elements of the environment as well as issues around the various elements and the attitudes and characteristics of the learner in relation to their learning environment.

Table 6: A sample of some of the tree nodes (main and first sub-level) from NVivo™ open coding

Main Tree Node	**First Level of Subordinate note**
Added element	
Assessment focus	
Asynchronous forum	
Communication	Asynchronous discussion
	Chat
	Connection with others
	Email
	Face-to-face
	Learning by oneself
	Phone
	Preferred forms
	Purpose of
	SMS
	Videos
	Which has more impact?
	Written
…	
Learning approach	
Motivational focus of learning	Assessment focus
	Career focus
	Lecturer-directed
	Personal interest
…	
Online environment	Attitude to
	Level of connectedness
	Relationship to physical environment
	Time spent per week
…	
Responsibility	Responsibility to lecturer
	Responsibility to self
	Responsibility to peers
	Responsibility to profession
	Responsibility to sponsor
	Responsibility to unit

To provide a visual view of this coding and to aid with the categorization, a mind map was generated from these coded entries, enabling the categorization to be developed. Mind mapping has been used in qualitative data analysis to provide an effective visual representation to show categories and key conceptual themes arising from the data analysis (Burgess-Allen & Owen-Smith, 2010; Jackson & Trochim, 2002; Meier, 2007).

The analysis here produced three main categories: the structural aspects of the environment, the conceptual aspects to the environment (i.e. the issues), and the characteristics of the various learning approaches of the participants that influenced the construction and use of the environment. This is shown in Figure 4. It should be noted that the mind map has considerably more detail than appears in the figure shown here. Those branches that are shown with an arrowhead ← contain sub-branches that have greater detail. These aligned with the coded entries in NVivo™.

3.7.2 Phase two – axial coding phase

The next stage of the data analysis was that of axial coding. Strauss and Corbin define axial coding as "a set of procedures whereby data are put back together in new ways after open coding, by making connections between categories" (1990, p. 96). With the first research question in mind, the original transcripts were re-examined in conjunction with the coded data, both from NVivo™ and the mind map, from the perspective of the individual learners to determine the categories of influences, needs and characteristics of the learner that impacted on the construction and use of the learner's learning environment. The focus of the categories was now re-aligned to relate directly to those features of the learner that impacted on the conceptual and structural aspects of the environment, and that took into account the learning approach of the learner. During this phase the mind mapping provided a valuable vehicle to enable the linking across categories and the creation of new ways of investigating the data. Its visual properties enabled the coded data to be viewed hierarchically in its entirety, and to map the information easily from the mind map produced during the open coding to the new mind map produced as a result of the axial coding. This analysis phase resulted in the identification of two features that influenced the construction and use of the learner's learning environment. The third feature was predetermined from the MBTI® assessment for each participant.

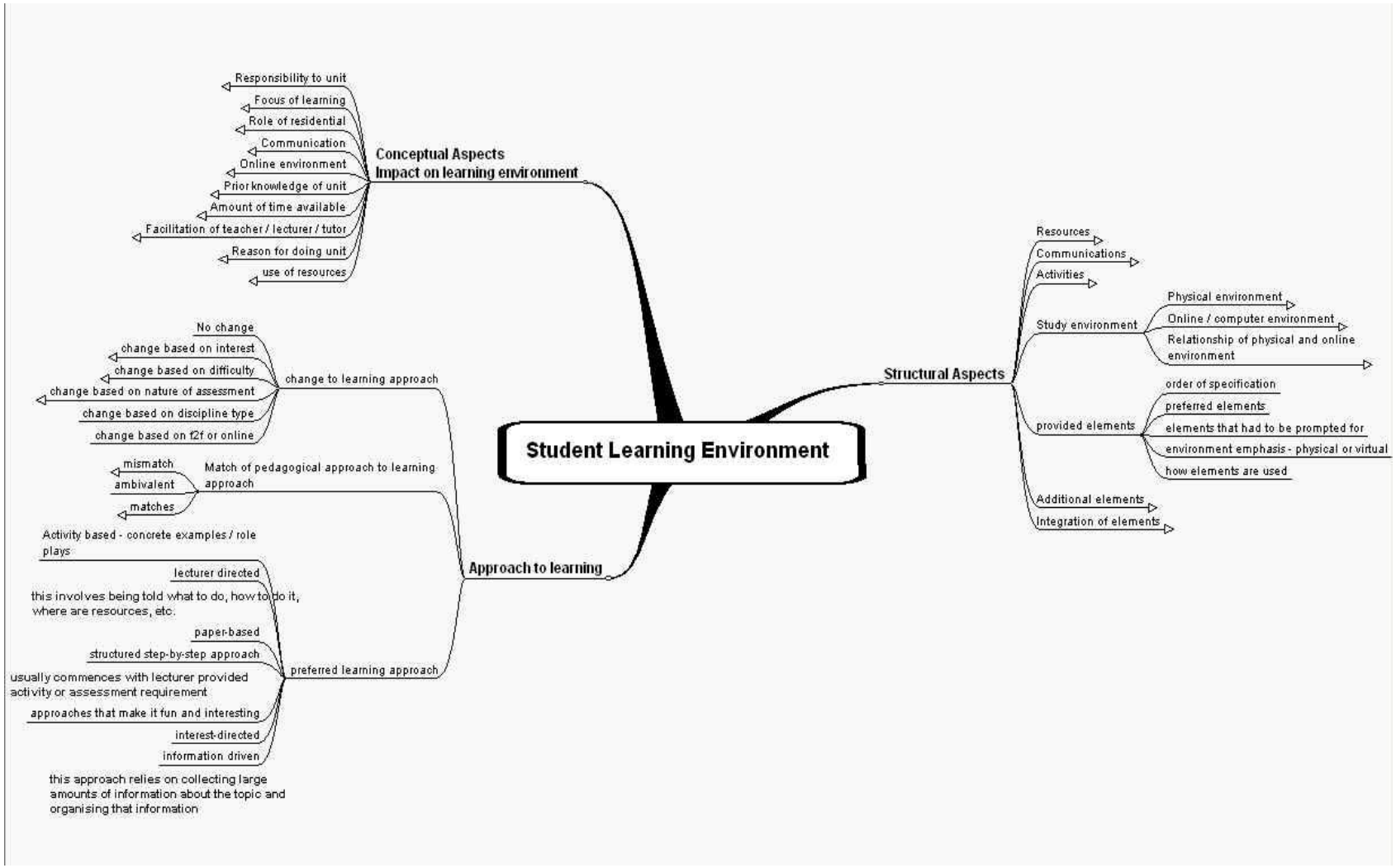


Figure 4: Mind map of open coding phase showing the aspects of the student learning environment

These three features were initially labeled “learner characteristics”, but were later renamed as “drivers” at the selective coding stage (see Section 3.7.3). These are shown in Figure 5, and form the basis of the three analysis/results chapters that follow this methods chapter.

Comments added to the mind map give further detail about the classification that highlight the nature of each distinct category and how that category is differentiated from the other sub-categories where relevant. Once again the full sub-categories have not been shown in this figure, with those branches that are shown with an arrowhead ← having sub-branches that have greater detail. Further detail under each category and subcategory was added during phase three of the data analysis.

3.7.3 Phase Three – selective coding phase

Phase three of the analysis was that of the selective coding phase. Strauss and Corbin define selective coding as “the process of selecting the core category, systematically relating it to other categories, validating those relationships, and filling in categories that need further refinement and development” (Strauss & Corbin, 1990, p. 116). Having identified the drivers from the axial coding phase and, using the mind map produced from the axial coding phase, the following process was executed for each of the three drivers. For the “Impetus to learn” and the “Self-perceived technology ability” drivers, each participant’s transcript was read again to identify which sub-category of driver the participant belonged to. The “Personality type” driver subcategory was already determined from the MBTI® assessment that each participant completed. The transcript was then worked through systematically, and in considerable detail, identifying the construction and use of the learning environment influenced by that driver sub-category. Consistent patterns for a sub-category were sought in the construction and use of the environment across the participants. This assisted with validation of the conclusions drawn as a result of the analysis.

The transcript was annotated and corresponding notes were made regarding the findings, a sample of which is shown in Figure 6. It shows a sample of the transcript excerpt and the associated notes relating to the ‘Impetus to learn’ driver in the sub-category

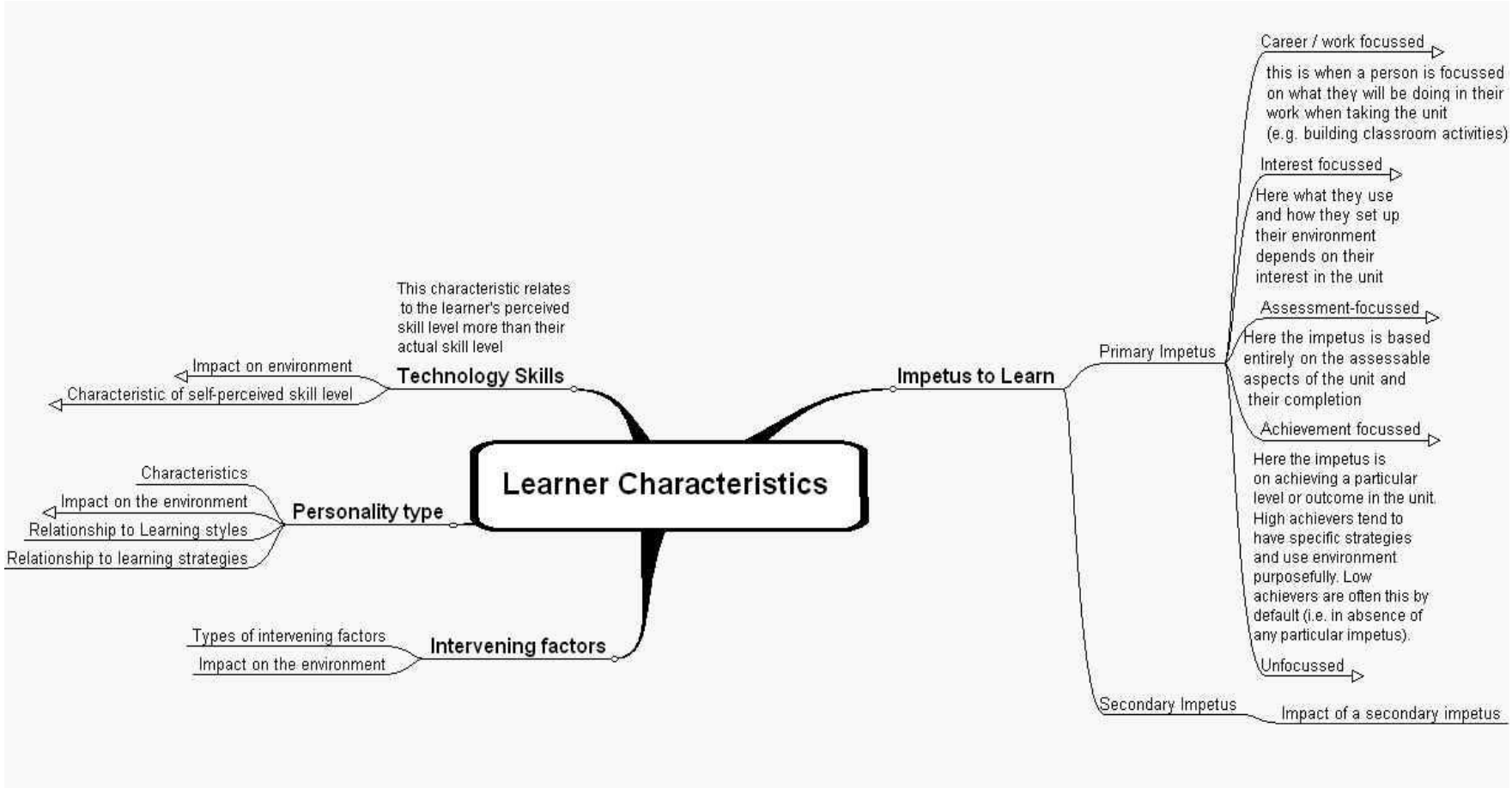
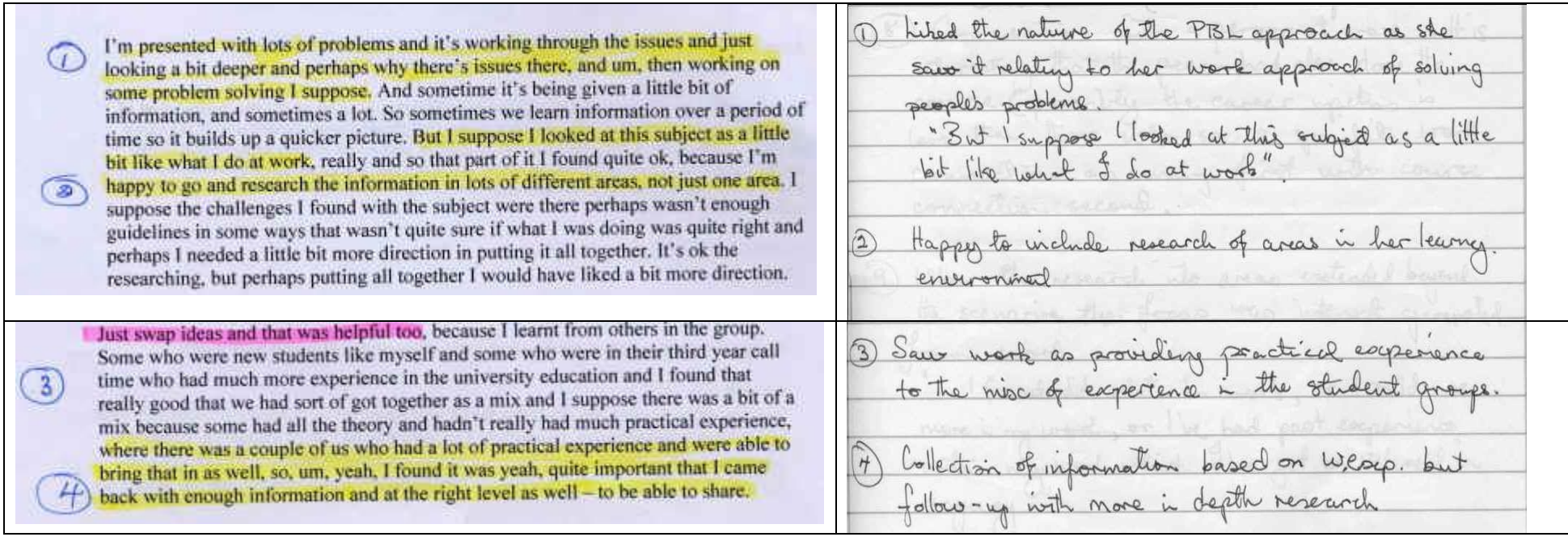


Figure 5: Mind map showing the main drivers identified from the axial coding stage



(1) I'm presented with lots of problems and it's working through the issues and just looking a bit deeper and perhaps why there's issues there, and um, then working on some problem solving I suppose. And sometime it's being given a little bit of information, and sometimes a lot. So sometimes we learn information over a period of time so it builds up a quicker picture. But I suppose I looked at this subject as a little bit like what I do at work, really and so that part of it I found quite ok, because I'm happy to go and research the information in lots of different areas, not just one area. I suppose the challenges I found with the subject were there perhaps wasn't enough guidelines in some ways that wasn't quite sure if what I was doing was quite right and perhaps I needed a little bit more direction in putting it all together. It's ok the researching, but perhaps putting all together I would have liked a bit more direction.

(2)

(1) Liked the nature of the PBL approach as she saw it relating to her work approach of solving people's problems.
"But I suppose I looked at this subject as a little bit like what I do at work".

(2) Happy to include research of areas in her learning environment

(3) Just swap ideas and that was helpful too, because I learnt from others in the group. Some who were new students like myself and some who were in their third year call time who had much more experience in the university education and I found that really good that we had sort of got together as a mix and I suppose there was a bit of a mix because some had all the theory and hadn't really had much practical experience, where there was a couple of us who had a lot of practical experience and were able to bring that in as well, so, um, yeah, I found it was yeah, quite important that I came back with enough information and at the right level as well – to be able to share.

(4)

(3) Saw work as providing practical experience to the mix of experience in the student groups.

(4) Collection of information based on W.exp. but follow-up with more in depth research

Figure 6: A sample from one interview – transcript and notes

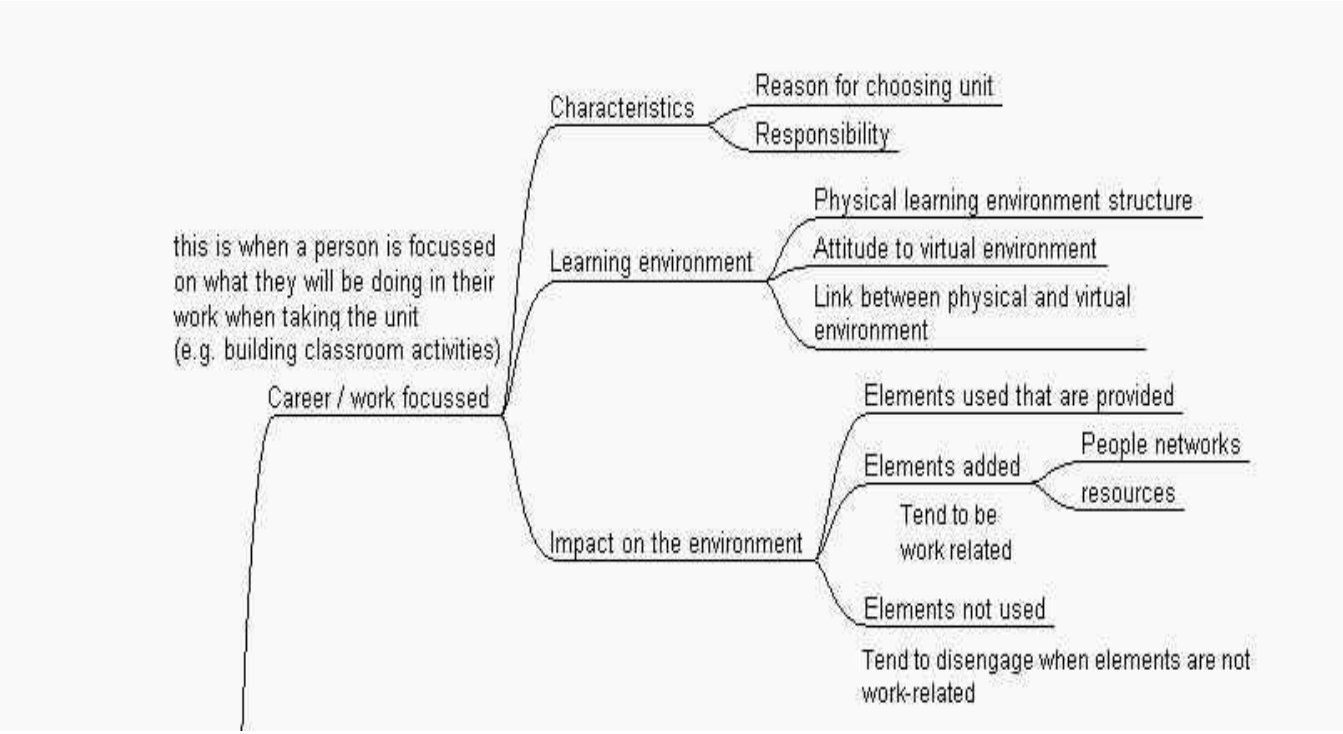


Figure 7: The mind map of the subcategory Career/Work under the driver category Impetus to learn

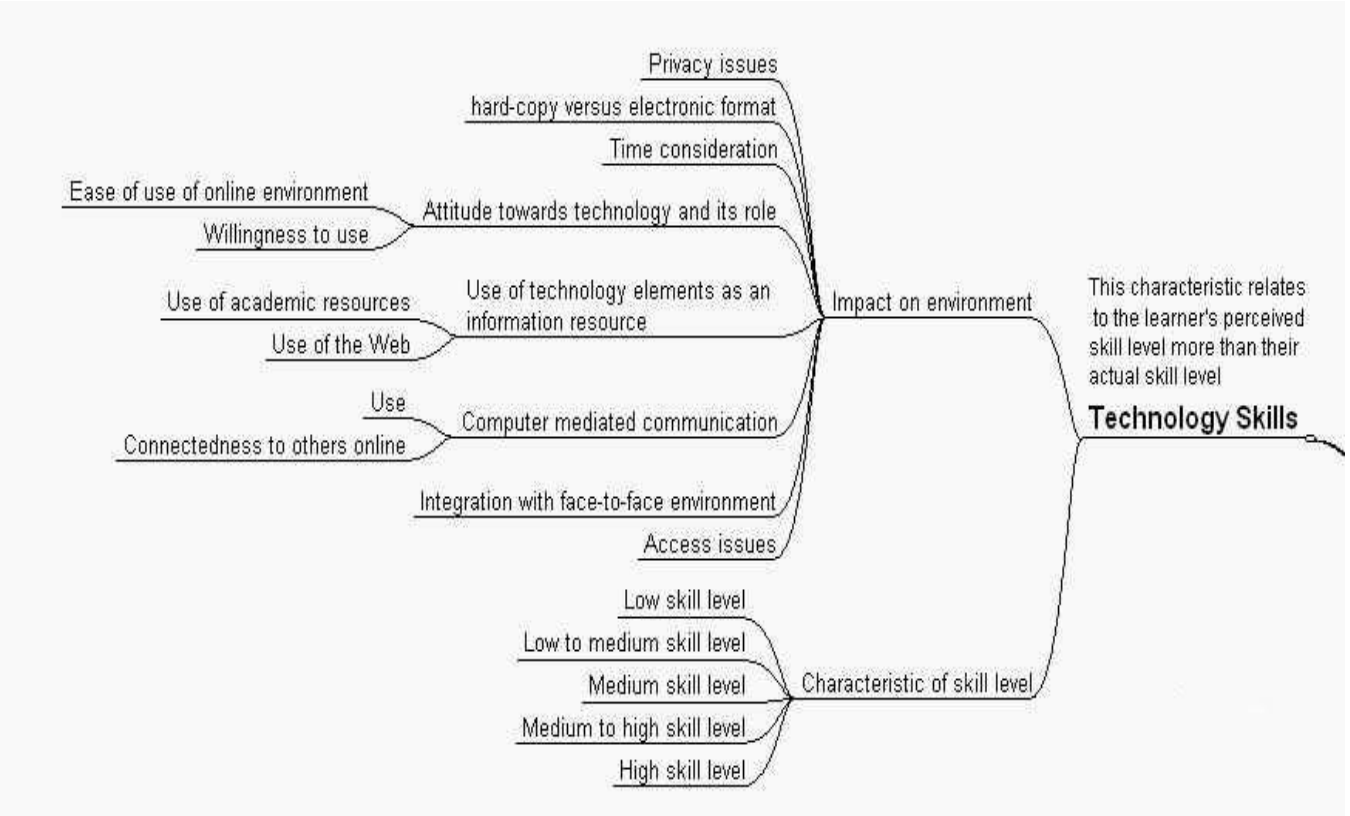


Figure 8: The mind map of the driver category Self-perceived technology ability

career/work focused. These excerpts show how the data in the transcript have been annotated to highlight the information about the particular driver. These notes were then used when looking for the conceptual patterns across the participants for that driver in relation to the construction and use of the learner's learning environment.

The mind map was also further enhanced to show the identified conceptual patterns that emerged from the data in terms of the particular driver or sub-category of driver. An example of this for the career subcategory of the "Impetus to Learn" driver and the "Self-perceived Technology Ability" driver are show in Figures 7 and 8 respectively. These sub-branches ultimately became the topics in the analysis chapters for these drivers.

3.8 Determination of participant's self-perceived information technology ability

Table 7: Descriptors for determining level of self-perceived technology ability

Level of self-perceived ability	Self-assessed competence	Use of technology outside the study environment
Low	Low level of competence (e.g. I'm not very good with computers [Kaitlin])	Minimal or no use at all – will use alternate mechanisms instead
Low to medium	Has some difficulties using the technology but is able to overcome these (e.g. It's a foreign place for me, but I think it's good [Angela])	Doesn't actively look to using technology
Medium	Comfortable using the technology provided. Doesn't comment on technology as an issue, just uses it when directed to do so (e.g. I use the Internet quite a lot … although I have to say I do prefer using hard copies [Catherine])	Uses computer as and when needed but doesn't show a preference for using technology
Medium to High	Good level of competence – actively uses the technology as much as other forms (e.g. I used the discussion forum bit a lot [Patricia])	Uses routinely in work environment and home use
High	High level of competence (e.g. I'm fairly strong in IT I believe [Derek])	Uses it on a regular basis and is integrated into lifestyle

As part of the identification of the self-perceived information technology ability during the selective coding phase, there was a need to determine what constituted each of the five levels of ability. This was identified by looking for particular comments in the interview transcripts that indicated a particular level of ability. These five levels are categorized as shown in Table 7.

3.9 Validity

The validity of the research needs to be examined for two areas: the validity of the qualitative research in terms of both data sources and the methods used, and that of the validity of the MBTI® data.

3.9.1 Qualitative research validity

Mason (2002) suggests that there are two aspects of validity that need to be demonstrated in relation to validating qualitative research. The first is that of the validity of data generation methods. It is necessary to ask "how well matched the logic of the method is to the kinds of research questions you are asking, and the kind of social explanation you are intending to develop" (Mason, 2002, p. 189). In this study the research questions focus on the needs and characteristics of the learner, and the influences (external and internal) on the learner that impact upon the individual construction and use of that learner's learning environment. To this end a detailed exploration of these features, through in-depth interviews of learners enrolled in a variety of tertiary units, provided a valid way of gaining the data. As Seidman (1998) observes "At the root of in-depth interviewing is an interest in understanding the experience of other people and the meaning they make of that experience" (p. 3). It is very much the interpretation of that experience that this study focused on. Also, as outlined in the section on data sources, choosing units that offered a range of disciplines, modes of delivery, technological elements and pedagogical approaches, together with participants that included both genders and both on- and off-campus enrolment, ensured that the findings were more likely to be valid across a broader context, and hence more able to be generalized.

The second aspect of validity for interpretive qualitative research is that of the validity of the interpretation. Mason (2002) indicates that

> this involves asking how valid your data analysis is, and the interpretation on which it is based. It is of course dependent upon validity of method, since your interpretation cannot be valid unless your methods and sources have enabled you at least to get at the concepts you say you are getting at. However, it goes further than this in that it directs attention to the quality and rigour with which you have interpreted and analysed your data in relation to your intellectual puzzle (p. 191).

For this study, the use of grounded theory as the method for analyzing the data provided this level of rigour by providing a systematic process. The data analysis section of this chapter outlines in detail the methods used, demonstrating the use of a systematic and thorough approach to the data analysis. Also the continual returning to the interview transcripts during each phase of the data analysis (see Figure 3) ensured the participant's voice and interpretations were faithfully reflected in the analysis, thus validating the analysis in relation to the phenomenographic methodology within the interpretivist paradigm. This strict adherence to the interview transcripts is also suggested by Green (2005) as a method of ensuring rigour in the level of trustworthiness of the analysis of the data.

3.9.2 MBTI® data validity

The validity of the MBTI® has been considered in relation to the separate functions or preference scales of the MBTI®. Chapter nine of the MBTI® Manual (Myers et al., 1998) covers the validity of the separate functions of the MBTI® in considerable detail, particularly in relation to other personality type indicators (e.g. 16 Personality Factors Questionnaire, Million Index of Personality Styles, Strong Interest Inventory). The studies show that

> correlations of the four preferences scales with a wide variety of scales from other instruments support the predictions of type theory regarding the meaning of and the behaviors believed to be associated with the four dichotomies. … An exciting new line of research was presented that uses

topographic mapping of brain activity patterns and provides strong evidence for the biological basis of the dichotomies (p. 219).

3.10 Issues and limitations

With every study there are limitations imposed by the nature of the research design, research strategy and the data collection that has occurred. This study recruited the participants from the tertiary university sector, and as such the findings are limited to this area of education and may not be applicable to other levels of education sector. While the sample size was relatively large (in terms of qualitative research), and an attempt was made to provide a range of different discipline areas and pedagogical approaches, the findings may not necessarily be able to be generalized across discipline areas not explored by the sample nor to other pedagogical approaches. Also, while the universities represented were from both regional and metropolitan Australia, this was incidental as the university locale was not part of the criteria for unit selection, and so was not considered in the data analysis. The study also did not consider possible age, culture or gender differences. It would be expected that a better balance of participants on the basis of university locale, age, gender and culture would be needed to include these aspects in the analysis.

There is also some limitation in the technology used by the units and the technology available at the time of the data collection. Technological advances are rapid and other technologies such as blogs, wikis, podcasts and social communication media are now available that have not been incorporated into this study.

3.11 Conclusion

The chapter has presented the research strategy and design used for this study, providing information about the reasons behind the choice of the particular research paradigm and methodology adopted. It gives details of the choice of data collection, together with an outline of the interview process that informed the data collection. It also gives a detailed description of the analysis process demonstrating the grounded theory approach and the use of mind mapping to facilitate this process. The validity of the research findings have been discussed, together with possible limitations and issues arising from the study.

Having established the methodology of the research study, the thesis continues by addressing the findings pertaining to each of the three drivers that influence the construction and use of the learners' learning environment (i.e. the two research questions) in the following three chapters.

4 Chapter Four – Impetus to Learn

All learners will have reasons for undertaking a university course. Some end up at university because of external forces such as parental, school or peer pressure. Some are motivated by a desire to change or improve their work situation, others are studying because they are particularly interested in the topic area being covered and others because they want a university qualification (Ellis, 1995). Schrum and Hong (2002), in their investigation of the characteristics of successful online learners, found that

> adults have a variety of reasons for seeking educational experiences, and these may include a mandatory upgrade of skills, requirement for additional credits to maintain licensure, need to change careers, or a simple desire to gain knowledge (p. 63).

Williams (2003) also found response to job needs and seeking knowledge about items of interest that occur in a person's life were motivators towards a desire to learn. In fact, surveys of adult learners often indicate more than one reason for engaging in learning, but the main reason many gave was that of job-related motives (Merriam, Cafarella, & Baumgartner, 2007 p. 62).

The desire to achieve also impacts on students' learning and their subsequent success. Loomis (2000) conducted research into study strategies using the Learning And Study Strategies Inventory (LASSI). One of the measures in this inventory is that of attitude (i.e. "the student's interest and motivation to succeed in college; and willingness to perform the tasks necessary for academic success" (p. 25)). His research found that attitude was a predictor of completion of the course. Those with low rating on the attitude scale were more likely to drop out. He postulated that this was because those who scored lower on the attitude scale had difficulty seeing the relevance of the course to their lives on completion of their studies. Similarly, Jones and Liu (2001) also investigated the characteristics of learners that affected achievement to the greatest degree. They found that students with an approach to learning centered on performance tended to be competitive in academic settings and hence high achievers.

If the impetus to learn impacts on attitude and learning strategies, then it is reasonable to suggest that a learner's impetus to learn will impact on the learner's construction and use of the learning environment. Van Petegem and Donche's (2006) research supports this. They conducted a study into personal and contextual variables and their relationship to learning patterns. Their results "indicate that within learning environments an interplay occurs between personal and contextual variables and students' learning patterns [of which] … motivational orientations were found to be relatively good predictors" (p. 107 - 108). This indicates that consideration of the relationship between the impetus to learn and the construction and use of one's learning environment is of use in educational settings, particularly for those educators seeking to use a range of learning technologies to support student learning.

So how does the impetus to learn impact on the construction and use of a learner's learning environment? From the interview data of this research, six separate impetuses were identified: 1) career impetus; 2) interest impetus; 3) assessment impetus; 4) impetus for high achievement; 5) impetus for pass achievement; and 6) an unfocused or undirected impetus. Each interview was analyzed to determine what the primary (and secondary if present) impetus to learn was for each of the participants. This is shown in Table 8.

This chapter, then, presents each of the six impetuses to learn, describing them in terms of how they shaped the construction and use of the individual learner's learning environment.

4.1 Career impetus

Career impetus to learn manifests for two different situations. The first is where the learner is already working in a particular area that closely relates to the unit they are studying, or the unit is furthering their current career or work. For example, Julia is a school teacher who is currently teaching Indonesian and is studying that unit.

Table 8: Participants and their identified primary (and secondary if present) impetus to learn

Name	**Unit**	**Impetus to learn**	
		Primary	**Secondary**
Anne	Integrated curriculum	Interest	Assessment
Astrid	Child Development	Career	
Angela	Technology for Education	Assessment	
Brett	Child Development	Assessment	
Barbara	Indonesian	Achievement – high	Career
Ben	Psychopathology	Interest	Career
Catherine	Integrated curriculum	Career	Interest
Claudia	Integrated curriculum	Assessment	Career
Donald	Integrated Curriculum	Unfocussed	
Derek	Child Development	Interest	Achievement - high
Esther	Integrated Curriculum	Unfocussed	
Elizabeth	Psychopathology	Unable to be determined	
Harold	Technology for Education	Achievement – pass	Interest
Harriet	Psychopathology	Interest	
Janet	Integrated Curriculum	Achievement – pass	Interest
Janice	Psychopathology	Interest	
Julia	Indonesian	Career	Interest
Joan	Integrated curriculum	Interest	
Jocelyn	Indonesian	Unfocussed	
June	Integrated curriculum	Unfocussed	
Kirstie	Integrated Curriculum	Assessment	
Kaitlin	Indonesian	Achievement – high	Interest
Luke	Indonesian	Achievement – pass	
Mandy	Child Development	Unfocussed	
Patrick	Psychopathology	Career	Interest
Phillip	Psychopathology	Achievement – default	
Patricia	Child Development	Achievement – high	
Rachel	Integrated curriculum	Assessment	
Samantha	Psychopathology	Career	Interest
Tanya	Psychopathology	Assessment	
Veronica	Psychopathology	Interest	Assessment
William	Psychopathology	Achievement – high	Interest
Yolande	Indonesian	Unfocussed	

Astrid works in a parenting centre, so the Early Childhood unit closely relates to her work. Samantha works as a volunteer counselor and sees the Psychopathology unit as providing informational background to further her work there and the Psychology

qualification as enabling her to move beyond volunteer status. Their interpretation of the aims and objectives of the units of study related back to their work areas.

> I really like being, I suppose for the work I do, I'm presented with lots of problems and it's working through the issues and just looking a bit deeper … But I suppose I looked at this subject as a little bit like what I do at work … . (Astrid)

> I've come with an aim of being able to teach and understand texts in Indonesian … I'm probably coming from an odd spot. Because I know what my students need and my need is to understand how they learn language, I'm looking at it from that parallel as well. What effect my struggles have and how did I overcome those struggles. What can I use from that to help my students overcome struggles? (Julia)

These examples highlight the extent to which participation in the unit of study is linked to their existing participation within the context of their work environment. Learners with this impetus to learn who are already engaged in their work environment saw their responsibility within the unit focused around their work role. They used the information from the unit to better inform their work situation; they engaged in analysis and research to support their own work situations; and provided practical experience from their work context to further the progress of group assignment work in the unit. Once again there is a linking of the work context to the unit of study that promotes this particular impetus to learn.

The second situation for learners with a career impetus to learn are those learners who already have limited experience from a work area and are intending to move into the career in a more formalized way. For example, Patrick is a school teacher who wishes to move into the Psychology profession via the student counseling environment, for which he is hoping to get sponsorship and so is studying Psychology. In the course of his interview, he repeatedly referred to his work or work prospects and saw his goals as more personalized for him in relation to career progression, with less responsibility to

others. Catherine was working as a practice manager, and through her work training staff, found that her interest in education was sparked, which caused her to enroll in an Education degree. She often made reference to her future career with comments such as *"I can see huge benefit to both me and my students … afterwards when I'm teaching"*.

For those with a career impetus to learn, the construction of their learning environment revolved around aspects of career and work. The data showed that the provided parts of the environment from the unit and the university (e.g. the asynchronous forum and the library) were used less than those elements they brought from their own work environment. Patrick and Samantha were passive participants in the asynchronous forum; Julia avoided it completely, seeing it too much like marking her own students' work (the forum was used to review assessable work); Catherine used the forum minimally, indicating she didn't get much value out of its use; and Astrid only posted to the forum because it was an assessment requirement. While lectures and textbooks were used as foundation resources, these learners were far more likely to use reference material and resources available from their work environments, with Astrid and Samantha using their work libraries and Julia using texts and books at work. Even Patrick, who did not have a work place, concentrated on university resources very much in line with his focus on his chosen career, and Catherine looked for resources when she had teaching rounds in schools.

> You can of course, access outside resources through the Internet and the library and other things that you come across. Stuff you gathered in schools. (Catherine)

> I search on the Internet for, sometimes to get a background of what's going on in the field. (Patrick)

These learners also built networks with others through their work, which were added to their learning environment in preference to forming networks with other students taking the unit. Julia talked with colleagues at work and practised her Indonesian with them.

She turned to these people rather than working with other students in the course, and turned to her colleagues first in preference to contacting the lecturer.

> Here at school I'll speak in Indonesian when I'm talking to other Indonesian teachers. … I've got some other people at work that are in the community that can speak in Indonesian, so I go that way rather than supporting other students. …I have to be extraordinarily stuck before I'll ring [name of lecturer]. I've got to have tried every other alternative, so I've got to have tried the Indonesian teachers here [at her work place], and I've got some people in the community that speak Indonesian. (Julia)

In this example we see Julia's career impetus to learn not only impacting on the context of her learning, but also in shaping the learning environment she constructs, with an emphasis on those aspects of the environment that are particularly connected with her work situation.

Samantha had communication links with those doing Psychology at her volunteer work, and Astrid had phone, email and face-to-face discussions with work colleagues, one of whom had also done the course. Even Catherine, who is not yet working in the field, had built up a network of other mature-age students with whom to have in-depth discussions about teaching practice, relating it back to observations during teaching rounds.

> We [the mature age students] have some quite rousing discussion about teaching and learning and our processes of teaching and learning. Students' processes of teaching and learning and things that we might have seen in schools that don't jive with things we've been taught here and vice versa…. We go off to all sorts of educational places that you don't necessarily cover in class. (Catherine)

In summary, those with a career impetus very much rely on augmenting their learning environment with features from their work and career. If the opportunity to incorporate

these features is not actively embedded in the unit, these learners will go outside the unit and disengage from the unit environment. There is a need to build into the unit mechanisms that enable these learners to tap into their work situations and bring their work experience and insights to the university learning environment to the benefit of all.

4.2 Interest impetus

Interest impetus is when the learner's primary impetus is that of interest in the topic area. Sometimes this impetus is generated from general interest in the topic area, and sometimes it is fueled from a personal connection with the unit's content. Derek has a wife with a career in Early Childhood and he has pre-school age children, so has a high level of interest in the Early Childhood unit he is taking. Ben and Janice, who are both studying Psychology, also indicated their respective family members had an interest in the Psychology area and passed relevant information on.

> Everybody in my family's either a nurse or a teacher … we're all interested in those kind of things … if my son or my daughter in particular, [found something] that they know relates to it [Psychology], they'll either cut it out or email it to me or give it to me. (Ben)

> My sister's interested in Psychology as well, so I talk to her. (Janice)

Those with this impetus will try and find an interest focus for all they do within the unit. This might be selecting an assignment topic on the basis of interest when a choice is possible, as in Harriet's case. Or it might be to actively generate interest even when there is no personal connection or they find themselves taking a unit they dislike or find difficult, as in Ben and Derek's case.

> Often there's a bit of a choice in terms of topics so you might say "All right, is there one that particularly interests me?" (Harriet)

> I like to become interested in the thing first, and so I convince myself that whatever it is, it is interesting and will be useful. And once I've done that then I can learn. (Ben)

> … if I really, … not so much I didn't like but I couldn't relate to [i.e. didn't have an interest in], um, I didn't put as much effort in. … It wasn't because I hated it. It's just, I just couldn't relate to it. … But you know, if it's difficult but I think I can relate to it, well that's where I go hard. (Derek)

The consistent feature of the construction of the learner's environment for those with the interest impetus is that of including features that facilitate greater exploration of a topic area. The textbook was often the starting point for this exploration process. For Ben, the textbook was a source of general interest with interesting pictures which he shared with family. Harriet and Janice both used the textbook as a starting point for the framework for assignments before extending their exploration with other resources, with Harriet often using textbooks from other units. Derek used the textbook as a trigger for further exploration and the lecture notes to extend his own notes

> I might even go back and check some other textbooks that I might have purchased, or I'll do units where there might actually be links back where I know, or I know that it had something about the topic. (Harriet)

> You get out the textbook and you read some of the explanations and the theories and you think, well, I want to know a little bit more about that and you often find in the reference section there'll be, um, web sites listed where you can keep going … . (Derek)

Extra reading formed part of their learning environment, with these learners seeking out large numbers of articles through the library, online databases, and, in Derek's case, full text articles on the Web.

> I use the Net comprehensively when I'm doing research on theories and practical issues as well. …I'd find a full text version [of a journal article] through Google…. I would look for extra information that way. (Derek)

> I probably get about 15 articles off the Net [reference here is to the online databases] from various places that relate to the topic. (Ben)

Janice even extended her range of resource exploration to include such things as films, documentaries and newspaper articles.

> I do lots of extra reading and um, looking at other media like, you know, associated if there's [sic] films or documentaries or things like that. ... Like I watch doc[umentaries]. I like all those shows like Catalyst and all the ABC [Australian Broadcasting Commission] type programs. They're really good. They give interesting angles. (Janice)

Communication networks were built with those who were seen to be interested in the topic – family for Derek and Janice, family and those in the counseling area for Ben, and friends in the Psychology area for Harriet. There did not appear to be any distinction made in type of media used to support the communication. It could be face-to-face, email, phone or online asynchronous forum, using whatever forms the learner was most comfortable with. Sometimes this communication was with work colleagues, but, unlike those with career impetus, the driver was interest, not the common work connection.
The focus here was on seeking more information and having an interesting discussion of the topic.

> [In the online forum] you could keep adding material to and respond to other people's comments and questions and that sort of thing. (Derek)

> At work there's [sic] obviously people to talk to. … If it's something specific I can't find the information on, then I will seek the person out, because I know they'll have the goods. (Ben)

Connection with the lecturer also helped maintain the interest level for these learners. Even though Ben and Janice were enrolled in a distance education unit, they both found that having lecturers who showed an interest in the topic area and in their students became a factor in keeping their own impetus to learn strong.

> It depends on that feel you get from [the lecturers]. You know, if you feel that they really care what you, how you're feeling, then you feel better about it. More motivated. … I like the ones [the lecturers] that have spunk and a bit of motivation to what they're saying - like having a bit of passion about it. (Janice)

Ben found the introductory lectures provided on video for another unit engendered this sense of connection as it helped him establish a relationship with the lecturer and with setting his own expectations regarding the unit. Derek also appreciated the input from the lecturer and having that relationship, particularly for the discussion tutorials for their PBL scenarios.

> … when we were in our group discussions, instead of just, you know, visiting and maybe just listening in, she [the lecturer] would get in and help us to formulate, you know, conversations and directions … which was good. (Derek)

In summary, those with interest impetus need an environment that encourages further exploration of the topics through information resources, or discussion groups that focus on exploring the topic area. These need to encompass a variety of forms so that the learner can choose those exploration pathways that suit them best, together with flexibility to allow time for this exploration to occur.

4.3 Assessment impetus

For assessment impetus, the data suggests that the focus is all about the assessment items, their requirements, and how to complete them. Hence the approach to the unit is to investigate what the assessment is, and determine how best to complete that

assessment. The standard of completion of the assessment varies from a bare pass level to that of a high level of achievement, but the work is still focused on this assessment. Learning about the actual topic areas of the unit is secondary, if present at all, and understanding is focused on what needs to be known to meet the assessment criteria. Sometimes learners will move into this mode for a unit if they don't see direct relevance to the final work outcome or if they have no interest in the topics of the unit. This can occur when units are compulsory.

> Interviewer: Had you read anything about the unit at all?
> Brett: Um, not beforehand …
> Interviewer: So you hadn't looked in the handbook to see what the unit outline was or anything like that?
> Brett: It's a compulsory unit so just turn up.

Brett saw his responsibility in the Early Childhood unit as one of completing the assessable work and engaged in extra work only when it directly related to the assignment completion.

> As we played the stories [the PBL scenarios], so that was different in that respect so you really had to, you couldn't just forget about your bit for that week, you know. Even though not every week you had to do something you really, the way it was structured you only had to, each person presented each week, so once, that was your assignment as well. (Brett)

This above comment from Brett suggests that he engaged in the work to further the assessable outcome of the group assignment, but that he wouldn't bother if it wasn't assessable. This was reinforced when asked if he would share his ideas with those in the same role as him, but not in his assessment group, and he responded with the following comment.

> I'd probably keep it to myself. Yes, if I had some gold piece of information I'd keep it to myself. (Brett)

A common feature of these learners is to only find out about the unit as it relates to the assessable work. Both Tanya and Claudia's only knowledge about their respective units was related to the assessment work of the unit.

> Interviewer: What's your understanding of the aims and objectives of the unit?
> Tanya: I don't have very much understanding of that at all actually at the moment.
> Interviewer: Have a guess. You must have some idea.
> Tanya: Not really. Basically, I just know that I have to do a presentation on a disorder, that I have to do an assignment and I'm going to do an exam and in the end hopefully I'll know something about psychopathology.
>
> Interviewer: So what did you know about the unit before you started it?
> Claudia: We had to produce an artifact.

Similarly, Rachel's reading of the Integrated Curriculum unit outline was limited to assessable areas.

> Interviewer: And you read that [the unit outline]?
> Rachel: Yes. Some parts of it. Perhaps the parts that I needed to, for assessment and stuff like that. …Besides the project stuff I haven't done anything else to do with finding out about integrated curriculum or anything like that.

This focus on the assessable work as the objective of the unit of study impacts on what they feel is their responsibility within the unit, which is the completion of the assessable work.

> Interviewer: What do you see your responsibility in the unit as?
> Claudia: Coming up with something, a piece of work that can be used by us and used by our peers – I'm responsible for coming up with a useable something.
>
> Probably my responsibility, because I'm a teacher I guess I sort of the teaching responsibility I see is basically to get my work done, to get it in on time so that the person that's marking it has adequate time to mark it and assess it.(Tanya)

Angela also saw her responsibility as the completion of assessable work, and only explored aspects of the unit further when she felt her exploration was being monitored by her lecturers.

> My responsibility in the unit is to obviously do my work per week, because it's always due per week. Do the required readings of the unit … Because I know that the lecturers get all our stats on where we've been on the [WebCT] site. … I think every student does try to swim about in the program just because they know they are getting analyzed for it as well. (Angela)

This focus on completion of assessment as the learner's responsibility shifts the learning to one of understanding enough to adequately complete the assessment requirements of the unit, thus these learners construct their learning environment accordingly and only use those aspects they consider will further the work of the assessment items or to check that they are "on the right track" for the assignment. Lecture materials and set texts were used to further the completion of assessable work, not for the information they might provide. They became an end in themselves, unlike those with an interest impetus, who used the text as a trigger for more exploration. Brett only looked at the lectures in terms of what was relevant to the assignment, and complained that the timing of the lectures didn't actively help him use the lecture content to complete his assignment work. The

textbook wasn't purchased and was only referenced if he was specifically requested to do so.

> If the criteria said I had to reference from the set textbook I would have gone to the library and photocopied a couple of pages from the set textbook and found something. (Brett)

Tanya focused on the study guide and textbook for her work, and Angela used the optional lectures to get assistance with the completion of her assessable work.

> I go to the lecture every week, which is optional, just if I have any questions. I find it helpful. It's an added extra. Then I go online and see what's asked of us. (Angela)

Claudia made a point of noting anything that was presented in lectures that had been identified as important to the assessment.

> I pay a lot more attention if it's brought up in a lecture or a tute "This is likely to be on the exam". … But anything to do with assessment I'll write down in my notes or I'll go back to the actual criteria sheet and so I'll underline things and put a little note to it that we need to address this … (Claudia)

The asynchronous forum was used in a similar manner, as a requirement for the assignment or to check to make sure they were on the right track where assignment work was concerned.

> I'll go online to check the bulletin board to see what people have submitted … I kind of really wait for them to put that on so I recognize what direction to really go. (Angela)

> You'd go in to check out what other people have posted and their messages and you can read what other people have written and go "Oh yeah, that's what our group is doing too." (Brett)

The pattern was similar for extra resources. The online library databases were not used by any of those with this impetus to learn. Tanya rarely used extra resources, only accessing those needed for assessable work or when clarification was needed in her understanding in order for her to be able to complete the assignments. She indicated she didn't access the forum and didn't use the online library databases, restricting the resources she did use to those she was most familiar with and had easy access to.

> Interviewer: Do you add anything else to what's provided?
> Tanya: Rarely, but in terms, if I find thins that I don't understand I'll usually go to the school counselor at my school, [and] another friend who's a psychologist. … But other than that I do, honestly, very little other wider reading on the topic. … I don't get very much time to sit and really explore and get involved in the material. …I don't really know how to use the library online stuff. … I might go the library or again talk to people in the area that might have journals or things to do with that [the topic for the assignment]. … And then I'll start to work on those points and develop them into an essay or if it's a report, similar sort of stuff.

Rachel did not use any resources beyond what she felt was needed for the completion of the project work. Angela felt the provided materials were enough and only used the Web to view her peer's Web pages to see what was expected (the students were required to produce a Web site as part of their assessable work). Brett used Web resources exclusively, focusing on their relevance to the assignment regardless of their authentication.

> I suppose, when it comes down to it, it's probably irrelevant to the assignment, whether it's [the web resources] uh, got backing or not anyway. You know, if it fits with the assignment, you just get your reference stuff like that. (Brett)

> I haven't read any books so far - any extra books. I haven't looked up Integrated Curriculum and that. Besides the project stuff I haven't done anything else to do with winding out about integrated curriculum or anything like that. (Rachel)

This pattern was repeated for communication with others – to discuss the assignment or to ensure that progress for assignment work was on the right track, as shown in these comments from Claudia and Tanya.

> We've had a few heated discussions [face-to-face] about what we perceive what it is we have to do and what's required. (Claudia)

> Interviewer: So what's the purpose of that communication [with her psychologist friend and counselors at the school where she works]?
> Tanya: I guess trying, I guess actually if I think about it, it's probably being able to verbalize what I'm thinking and find out if I'm thinking the right thing. If I, I guess it's about like getting approval like "Yep, you're on the right track", "Yep, geez that's a really good idea you've had". I guess that's what it is.

In summary, these learners with an assessment impetus to learn construct their own environment from what is provided that specifically relates to the completion of the assessable work. Their primary sources of information become the content provided within the unit (i.e. lectures and set texts) and resources that will enable them to complete the assignment work. They also incorporate into their own constructed environment supports from what is provided within the unit that can assure them they are "on the right track". Communication is limited to assessment requirements and outcomes for the assessable work. Aspects of the learning environment will only be used if the learner can see a clear link to the assessable components of the unit.

4.4 Impetus for achievement

Those learners with an impetus for achievement fall into two categories. The first category is when the impetus for achievement is about the learner achieving the highest mark for the unit, although this is more often expressed in vague terms as "doing one's best" or "achieving the best I can" rather than achieving a specific grade. The second category for achievement is where the learner is only interested in achieving a pass grade, and will often express this as doing enough work to pass. Unlike the two career impetus categories, which have considerable overlap in the construction and use of the learning environment, these two achievement categories need to be treated separately, as the environments that result are quite different.

4.4.1 Impetus for high achievement

While assessment impetus and achievement impetus are similar, in that they both require attention to the assessment items, there are subtle differences, particularly in the scope of what is done in the unit. For the learners with high achievement impetus, work extended well beyond the assessment requirements. They saw their responsibility as involving more than completion of the assignment work, with a requirement to work hard, study and engage in activities that extended the work in the unit, whether on their own or with others.

> I think I have a responsibility to actually do the work that's assigned for me otherwise there's no point going. And participate as well. … I've got a responsibility to be engaged with them [other students] as well, um, because we, because it's very much a learning study subject. We have to practise the way we speak, so that, yeah, I have to co-operate with them and yeah, practice speaking with them. (Kaitlin)

> My responsibility I think is to do the best I can. I mean, the lecturers give us the information. It's then up to us to go away and to actually study it and put work into it. … After I've left the class I have to then go on, do more reading, um, do more speaking in my bedroom to my mirror – that sort of thing. (Barbara)

> So it's our responsibility to do the work, do extra work if we need and um, participate, um, turn up to lectures, to get the best out of it. (Patricia)

In these comments, there was no actual mention of specific assignment work, just the sense that they needed to work hard. There is often the comment of doing extra, and these extra activities undertaken by the learners were things that helped the learner achieve a better grade in the unit. In Kaitlin and Barbara's situation it was practising their use of the Indonesian language, and in Patricia's case it was considering more possibilities that affected the child's development for the Early Childhood unit. This is further illustrated by Kaitlin and Patricia's comments below.

> I bought that [the Indonesian dictionary] way before he [the lecturer] suggested it though, because I needed to practise stuff. (Kaitlin)

> I guess in taking the initiative in um, the group work. Doing extra, like um, you've got standard things that you need to do and the stuff we've discussed in class, but thinking of things that may not have been discussed, like further research. (Patricia)

From these comments we see an engagement of the learner in the learning process that causes them to take the initiative in their learning.

There may also be an interest element to the impetus; however, when the primary impetus is high achievement, there is nearly always an additional comment regarding their achievement in the unit as illustrated by this comment from Barbara.

> Well I really like this subject. I want to do well in it. (Barbara)

Their lack of achieving a high grade may also influence their choice of units, as in Kaitlin's case.

> I was getting Distinctions, that's still good but not my, you know, top of the range, so I was in 'Well I'm going to drop History. I'm not getting good marks so this is [no good]', and this year the English has gone way down and History is back up, and I'm like 'Hmm, maybe I should change my major' so it's [the achievement level] definitely a motivation factor. (Kaitlin)

Learners with this impetus tended to try and complete as much work as possible. There is the sense that they complete the set work first before doing extra work.

> I've got the CD's I've got to do, so I always leave the grammar part 'til last. … I'll do the CD first and if there's a word on the CD that I don't understand and things I'll look it up in the dictionary. … I'll do the CD first. (Barbara)

> I usually do what's asked of me first and before you do anything else. (Patricia)

Here we can see that these learners are aware that the set work is an essential part of high achievement, but that there is also a need to do more.

The learning environment of these learners was set up to achieve this end, and resources were utilized that enabled the leaner to carry out the set work and their own further work, ensuring their questions about the unit were answered and their understanding of the topic areas were clarified. They used whatever resources they felt most comfortable with, utilizing face-to-face and online communication, information resources provided by the lecturer, and a range of additional resources as they saw fit. Barbara utilized email to gain help directly from the lecturer, Kaitlin preferred face-to-face communication and Patricia used a range of methods including email to share work with her assignment group, online asynchronous communication with others enrolled in the unit, and face-to-face communication for exploration and discussion.

> I email him [the lecturer] a lot with some questions. … I'll be more likely to send him an email to say 'I don't understand' instead of posting it to everyone and saying 'can anyone help me?' (Barbara)

For Kaitlin and Barbara, who were taking the Indonesian language unit, discussion did not rate highly in this unit of study for these learners because the focus was on achieving a high grade, not on exploring the unit. Their focus for this subject was on learning the Indonesian language, not on the exploration of concepts, therefore discussion was not considered necessary to achieve the desired outcome. Neither of these learners used the asynchronous discussion forum beyond submission of their work, and face-to-face encounters were used purely to gain assistance with the unit or to practise their language skills.

Where units do require discussion in order to gain an understanding of the conceptual framework of the unit, and to explore different perspectives, this was undertaken quite extensively.

> It's [communication] definitely needed by me. It's everything, like I need to nut out my ideas and things like that, so it's vital. I think a lot of people would agree in our course [unit] that because it's not all fact, that communication is essential. For me especially, I need to know that my ideas [are valid], hear what people think of my ideas and things like that, and so definitely essential. (Patricia)

This comment from Patricia shows she is aware of the need to explore ideas in the Early Childhood unit in order to get the most out of it and hence achieve. Kaitlin similarly indicated discussion was extensive for those other units she was studying, such as English Literature, which required an exploration of ideas to do well in the unit.

> I really enjoy, I've got a good group of friends um, who are into the same sort of thing and read the same sort of literature so I'm like, having discussions with them about it. (Kaitlin)

Other resources were utilized by learners with a high impetus to achieve when they were considered necessary to support their high achievement in the unit. Barbara used the provided CD-ROM to do the weekly activities and for practice, completing all exercises each week even though the assessment only required the completion of one exercise. Kaitlin made extensive use of the study guide. Her use of the CD-ROM was fairly limited, preferring to add her own resources for practice, such as movies and newspapers. Her reason for not using the CD-Rom was a technological difficulty, not because she didn't want to complete the work. Patricia completed required pre-reading for the lecture so that she could get the most out of the lectures, and would then follow up with additional reading.

Networking was extended to those people they considered could help them learn. Barbara mentioned her sister in a helping role.

> My sister studies Indonesian and she helps me a lot. (Barbara)

Kaitlin also mentioned her ex-husband in a similar role.

> My ex-husband as well helps me a lot with my studies. … Yeah, just through email. Like I could attach something and say "can you check this?" and he will and then send my like, yeah, an edited version with corrections he thinks I should make. (Kaitlin)

Patricia talked to a family friend who was a psychologist. This fitted with her studies in the Early Childhood unit as she had the role of psychologist in the PBL scenario.

> I talked to one – a psychologist. That was briefly, through a family friend, so it wasn't really formal or anything. It was just I brought it up. (Patricia)

This is interesting to compare with those with interest impetus, who also had discussions with others. However the purpose of the discussions was quite different. For those with

the interest impetus, the purpose was sharing a common interest in the topic and to have interesting discussion, whereas for those with high achievement impetus, the discussion was used as a means to an end – that of achieving a better result.

In summary, these learners with an impetus for high achievement construct their environment to assist them to understand the content and concepts of the unit and achieve the highest grade possible. They will utilize a range of media, usually on the basis of familiarity, choosing those that are most appropriate for clarifying their understanding and extending their work in the unit beyond the basic curriculum. These resources will include knowledge resources as well as communication facilities, and will be selected from those provided within the unit as well as from their own repertoire.

4.4.2 Impetus for pass achievement

The learners with an impetus for pass achievement have made a conscious decision to only work to a pass grade level. As the focus is on completing enough work to pass, learning tends to be almost by accident. There is no real effort made to find out about the unit, nor is there any purposeful attempt to determine what exactly they are learning about. Luke showed this when asked about his understanding of the Indonesian unit.

> I haven't really paid much attention to it [the aims and objectives of the unit] actually, like the way we're actually supposed to be, why we're learning what we are. (Luke)

This was also shown by Janet when asked about how she integrated the different aspects of her learning environment to support her learning.

> Interviewer: How do you integrate all those things together to support your learning?
> Janet: I don't.
> Interviewer: So you see them as separate little bits?
> Janet: They all link together, but I don't sort of think about it in great detail. … WebCT is just something I've got to do. … I can make links,

> like just as they're talking in class, like they talk about WebCT and how it links to the lecture that we've had this week so you can see those sort of links, but I don't sort of go away and think deeply about how it all fits in together.

These two examples show that these learners are not really connected with the aims and objectives of the unit of study, focusing only on what must be done to pass that unit. This is demonstrated quite clearly when asked about their responsibility in the unit of study.

> Responsibility to get the work done, and, yeah, I think that's about it. (Janet)

> I guess it's mostly a responsibility to myself to actually do the work, and to actually pass the subject is my responsibility. … basically to pass. (Luke)

> To understand it as best I can. To get my head around everything I need to as quickly as possible, so that I can push that away and get on with the next thing. Just work through it. … I mean the whole aim of this and the end is to get to a certain point which gives me a degree. (Harold)

As can be seen from these examples, the focus is on getting the work done to meet the pass requirements. Even when there is a comment related to understanding, it is presented as a transitory state in order to get the necessary pass and move on. As a result, these learners with an impetus to achieve a pass grade are far more closely allied with the assessment impetus category. As for the assessment impetus group, the learners in this pass achievement category have a much greater emphasis on the assessment requirements and completing just enough work to gain a pass grade. There are subtle differences however, in that the focus here is on attempting to learn what is needed to pass, rather than a focus on the assessment criteria and working to meet those criteria, as is the case for those with assessment impetus.

> In a typical week so far I go to the lecturer, listen to what they have to say. … usually after the lecture then I go away with my friends and discuss what was talked about. So in a smaller group. And then we usually go straight to WebCT and complete the activity together [assessable item] and get that over and done with. … get it out of the way and done with and then I don't think about it again. (Janet)

> It's finding out what they're going to asses you on and learning that rather than learning about the subject in general. (Luke)

Here we can see that while both Janet and Luke focus on the assessment, there is a sense that they need to learn and understand the content in order to complete this assessment, rather than just meeting the criteria for the assessable items.

As a result of this approach, these learners construct an environment that utilizes resources that enable them to learn and understand enough to complete the assessable requirements to achieve a pass grade. These tend to be resources that relate to compulsory work or that directly impact on the completion of the assessable work, as can be seen by these comments.

> As minimal as is required to fulfill the tasks. (Harold)

> Interviewer: … tell me what you think has been provided for you, and that can be anything that you think is available within that unit for your use.
> Luke: … The environment they've given us is both the classroom and the online, given kind of the MUSO site [name of the WebCT Vista site used at Monash] as the discussion product, or what it was, which I for one, didn't know how to use and secondly, didn't want to use.
> Interviewer: Anything else you've been given?
> Luke: Um, aside from the book which we're supposed to do, the books and the media, the CD which they gave us - I've got to admit I haven't

> actually used that, it doesn't seem to impact directly on the course, so I've no real incentive to use it.

Luke is aware of the resources available, but doesn't see the need to access them, as for him they do not impact directly on the unit, that is, the aspects that enable him to achieve a pass. Janet similarly indicates this in the following comment.

> We've got a WebCT that's got articles on there that you can read. So it's a good resource but I haven't used it. (Janet)

Janet recognized the potential of the resource, but with her pass achievement impetus she only used the components of the WebCT that were compulsory to complete the assessable activities, not those resources that might provide extension within the unit.

Resources are used that minimize the effort required of the learner. If the effort has to be self-directed then it is unlikely to be carried out, as can be seen from this comment below.

> I do actually like the classes, I do think they're really useful for learning the actual language themselves, it's just the online that I don't like. (Luke)

His interview transcript indicated a low level of IT skill, which meant that considerable effort would have been needed on his part to learn to use the online resources. Janet also taps into her friends as a resource, using them in a similar manner to Luke's use of the classes to enable her to complete the compulsory work.

> I have trouble understanding, like, things we have to do on WebCT, so my friends, I rely on my friends greatly, so for that and also to understand the concepts as I said before in the unit. … I always get together with my friends to complete the WebCT activities and to discuss what's going on in the [unit], because I have troubles of sometimes

> putting together my understanding of the unit, so it's good to hear my friends' point of view and sort of then construct my own sort of theory of what it's all about. (Janet)

Here rather than working herself to understand the concepts, she relies on others and their perspectives before she is able to construct her own understanding. This role of others is reflected further in the purpose of communication for these learners and their subsequent use of communication resources.

> For me it's [communication's] mostly clarification basically on anything, but especially on the language itself. (Luke)

> If you don't communicate with anyone you're not going to learn anything. You won't fully understand the tasks. You won't understand where you're going to send your learning off to. Only by discussing things that we've been asked to do with other students or with lecturers and tutors or getting clarification on points or finding out what extra you're going to look at do we know where we're heading.(Harold)

It can be seen from these comments that communication is used to ensure that they are "heading in the right direction" and that they have done what is necessary to complete assessable work to a pass level. This is similar to the assessment impetus learners; however, while the assessment impetus learners focus on the assessment requirements, for these pass achievement learners there is still a focus on understanding and learning, even if that level is only to the extent required to achieve the pass grade. This is further illustrated by Harold's comments on his use of the lectures in the Technology Unit he is studying, which were for further discussion about topics, and not for imparting new information.

> It [the lecture] gives me the direction for where I need to head. I mean I have to head in the direction that will satisfy the requirements so I can pass. By clarifying what they've already said and working out where the

> gaps in my knowledge are by discussing it with them [the lecturers], I can work out what I've got to go and do next to manage to get to that end result. (Harold)

Once again, Harold shows that he is not interested in exploring more of the unit content, but just ensuring he is "heading in the right direction" to complete the pass requirements. The online asynchronous forums were only used when compulsory. Luke, therefore, didn't make use of these at all as they were optional in the Indonesian unit for on-campus students. Janet did complete the compulsory sessions, but only posted messages that indicated agreement with what others had posted and Harold only used the online discussion facilities to submit required work. Additional resources were not added to their learning environments, as once again, the focus is on passing.

> I usually do what I have to do to pass. I don't sort of, yeah, I just do what I have to do. I sort of don't do any extra reading or any extra, sort of, learning. (Janet)

> No. I have enough trouble getting through the workload presented without adding to it. (Harold)

They saw any use of additional resources as going beyond the pass requirements of the unit, and hence unnecessary.

In summary, these learners with an impetus for pass achievement construct their environment to satisfy the completion of the necessary work, and to understand enough of the unit content to enable them to complete the assessable work to a pass grade. They use the resources provided that will enable them to achieve this, using communication to clarify their understanding and ensure they are "heading in the right direction".

4.4.3 Special case

Sometimes learners end up having an impetus for achievement almost by default. They have not been engaged in study for a long time, if at all, and so do their best to try and

engage with the content to understand it, hoping for at least a pass grade when they complete their assignments. They tend to rely on innate ability and good luck rather than on a purposeful construction of an environment that will assist them to achieve. This was the situation for Phillip. The selection process for units follows a similar ad hoc pattern, as can be see by the comment Phillip made about his way of choosing a unit.

> Interviewer: Had you read the unit outline?
> Phillip: No. I choose the subjects on a web page. I just see what's available next semester and which ones I have to do and which ones I can take with them. … Stab them with a pin.

This ad hoc approach was also reflected in his choice of the degree program he was undertaking.

> I left school when I turned fifteen. I didn't consider school was good for anything. I just knew doctors and lawyers had been to uni and that was it. And I found myself out of work a couple of years ago and I got bad news. I can't work with shovels anymore very good [sic]. And I thought I'd ask if I could do something at University and get a job indoors. And they said "Sure. What do you want to do?" And I said "What can I do?" And they said "Social sciences or something", and I said "All right" and I signed up for that. (Phillip)

This comment indicates he ended up at university through circumstance rather than deliberate choice, and enrolled in a Psychology degree because it was suggested, rather than his preference. From this one might consider that his impetus to learn would be unfocused, however his comment about his responsibility, as seen below, indicates there is an achievement impetus.

> I'm responsible to myself to not incur my HECS debt for nothing and to try and pass. … I'm responsible to [the lecturer] to not cause her any

> problems and perhaps even get a pass and make her feel some achievement. (Phillip)

Because his confidence in his abilities was unknown and therefore unsure, his achievement level was spoken of as gaining a pass. He did, however achieve higher grades, so was willing to work to the best of his ability, albeit somewhat lacking in study technique or strategy.

The construction of the learning environment for this learner is more closely allied with the high achievement impetus group, but his lack of familiarity and confidence with university study impacts on this. Resources provided were all used regardless of whether they were mandatory or optional, however, due to lack of study experience, little if any discrimination was made regarding the importance of the resource, or their potential relationship in attaining a particular level or achievement. He participated in the online asynchronous forum, however his participation was passive, reading the comments of others but not contributing himself. This once again reflects his lack of confidence in the study arena. Extra resources were also used, however these tended to be those suggested by those running the unit rather than a selection of his own, and communication was used to provide assistance (i.e. fixing up grammar, checking the overall writing style) rather than further discussion of topic areas.

4.5 Unfocused impetus

For learners in this category there is no single driving impetus to learn. This appears to occur when a unit is compulsory or is taken for expediency rather than a specific connection with the subject matter of the unit. Yolande selected the Indonesian language unit as she had to choose an Arts subject and this unit was conveniently located at the campus where she was enrolled. The rest of the learners were all taking compulsory units: Esther and Donald were required to do the Integrated Curriculum unit, June was required to do the Technology unit and Mandy was required to do the Early Childhood unit.

> Well personally it's because I had no choice. I had to do a language for this subject. If I had my own choice I would have done French, because I did French up to, from Year 7 to Year 12, so I did it for five years and felt more comfortable with, you know, going along that road rather than starting an entire language again, but because I had to go to Clayton to do French, I decided to stay here [home campus of Berwick] and do it [the Indonesian unit]. (Yolande)

> Interviewer: Why are you taking it [the Early Childhood Unit]?
> Mandy: Because it's one you have to. You've got no choice.
> Interviewer: Would you have taken it if it had been optional?
> Mandy: No way.

These comments indicate that neither Yolande nor Mandy would have taken the units if they had had a choice, and this exacerbates their disconnection with the learning for the unit. This disconnect commenced prior to the actual engagement in study for the unit, with the learners in this category knowing little, if anything about the unit prior to studying it.

> Interviewer: How much did you know about the unit before you commenced it?
> Esther: Next to nothing.

> Interviewer: Did you know a lot about the unit before you started it?
> Yolande: Not at all.
> Interviewer: Had you read anything at all?
> Yolande: No. Not one thing. I did know a bit of the language before I started this course [unit], but not about this course [unit] itself.

> Interviewer: So you didn't get a set of aims and objectives or anything at the start?
> Donald: We would have got the outline but they are usually always the same sort of thing for every unit.

> Interviewer: So you didn't read it?
> Donald: To be honest no. I've usually, around the time to do the assessment, I'll read through the guidelines for that, but usually … I think they went through it but as I said they're pretty standard kind of outcomes usually.

> Interviewer: How much did you know about the unit before you tackled the study?
> June: Absolutely nothing.
> Interviewer: So you didn't see a unit outline?
> June: No. Well, no, I probably got one but as far as reading it, I didn't really read it.

This is further reflected in the learners' comments regarding their responsibility in the unit.

> Um, well my responsibility is to actually have motivation to be able to learn. I found because I did first year Arts last year, I found motivation an extremely difficult thing by second semester. (Yolande)

> Basically with the WebCT that we're doing, it's pretty much self-directed. We do the research ourselves and put in where we want to go with it. (Esther)

> It's probably a lot of research. To understand what I'm doing for a start and where I'm going with it. Be able to comprehend why I'm doing it. (June)

These are the only learners who indicate responsibility is about self-direction and motivation and determining why one is doing the unit. This would seem to suggest that these learners are aware there needs to be some sort of impetus to learn, but this is somehow missing and they see their responsibility to somehow generate this impetus. Despite this recognition of the need to generate an impetus, they are unable to achieve

this for themselves, relying on external direction. When they feel that this direction isn't given they struggle with the unit.

> You have to go and learn it for yourself. She [the lecturer] provides a list of the texts and [she says] "you go learn it for yourself. I'm not helping you. Don't be lazy." (Mandy)

> I found that they really haven't given us a lot this time, a lot of core material and theory, not very much, about our own learning and I guess what our appropriate project will be will determine what we learn I think. … they're not really giving us much to go on except maybe the WebCT tasks they give us. (Donald)

This external direction is closely allied with the tasks set for completion within the unit and the assessment requirements. While this is similar to the assessment impetus and the pass achievement impetus, it is a focus rather than a driver. There is a sense that they need to complete work to gain credit for the unit, however the work is seen as just part and parcel of the nature of study, rather than an actual impetus as it was for the assessment impetus group, or a means to an end as for the pass achievement impetus group.

> I think it is as much as you want to get out of it you will get out of it. Being very open you can put as much or as little into it as what you like. I mean in terms of your project that will define what you learn, and if you decide to do a really narrow thing you are not going to really learn much. (Donald)

> Well it's all sort of separated into the theory and general readings that we've got to do, things like that, and each week separated into what the task is, what resources we might like to use, how we might reply to that, respond to that. (Esther)

> We're given a site to look at and we go there to get the information about the unit and what's expected of us each week and any tasks that are involved in that. So we have to go there and we read the information and if there's something to do online, like there might be a questionnaire or something, you do that there and then. (June)

> We've got a unit guide to help with assignments and stuff like that. But then we've got the bigger book. I can't remember its name, but it basically outlines everything we do. It gives, because we usually do, um, a role-play, not a role-play, it's just a play between two Indonesian students which is transcribed into this book. And we basically study them, study the Indonesian edits and so it just lays out exactly everything we need to do for un, one particular week. (Yolande)

The above comments were all made in response to a question about what was available in the provided environment, with no mention of assessable work or set tasks made by the interviewer. As can be seen, these set tasks and assignments take on a larger significance in determining what work is done, and therefore what learning takes place.

As a result of this focus the learning environment set up for learners in the unfocused impetus category was designed to achieve this end. While the learners talked of doing research, they tended to use resources because they were specified to be used or they were directed towards those resources.

> It [the WebCT site for the unit] points you in the direction of further readings that you can do on, so that's on the computer [data] base and obviously you go to the further readings, texts or journals or whatever it might be that will give you the information you want. … I found that I would read where they'd written, or read something and they'd marked it in there where they'd actually [found it]. So I'd write down where they'd got their information from and go on [to the online library system] to see if I could find those texts. (June)

> Interviewer: Do you use them [the provided resources] in a particular order or a particular way?
> Esther: Not really, no. Just whatever the task requires.
> …
> Interviewer: You don't find the use of one particular element or facility within, say, the online environment, triggers you to use something else?
> Esther: Not really. It's really up to the task. If the task says to do this, then that's what I'll do.

> You were supposed to contribute twice to the online discussion, and so I think I did three times. That was about it. (Mandy)

> Interviewer: If you get a topic do you go off and explore on your own?
> Donald: No. I haven't been to a library or looked at books or anything like that yet.

As can be seen, exploration of resources is not undertaken, and resources are only followed up if they are easy to track down from the information provided, or are essential to the tasks and assessable work.

Their use of resources changes when they have an interest in the topic areas being covered, as can be seen by the following comments.

> If you are not interested at all you find that you do what you need to do to do the assessment task. Yet other units, like the special education unit I found myself looking for more information on things, you know, doing extra reading besides what is set for you that week because it actually sparks an interest and you are trying to link the theory to things you've seen out in schools and stuff like that. (Donald)

> It it's a unit that I already know something about or there's something in my life that I would benefit from doing it other than just the end goal, I find it easy. I find the research isn't tiresome and I don't feel like I'm

> being punished or made to do something. In fact, I feel that I'm enjoying trying to obtain more information and be that step ahead of it. (June)

> Oh well, I'm off. I don't even need a lecture or a tute. I just sort of, yeah, I'm happy to just go and research it and to, you know, I guess, for computer art, I mean I never really appreciated computer art until I did the subject. I though it was a bit, you know, anybody could do that, but you know, I started going to galleries just to computer art exhibitions and started to look at different artists on the Internet. I started experimenting using various different programs. (Mandy)

For these learners, when there is a natural connection with the unit being studied, their interest impetus enables them to do extensive exploration, which is a characteristic of the interest impetus group. However, unlike the interest impetus group who will look to try and find a connection with the unit content to make it interesting, these learners in the unfocused impetus category seem unable to do this for themselves, and just disconnect from the unit, only focusing on getting the set work done.

In summary, these learners with an unfocused impetus to learn construct their environment to complete the set work. They will use what is provided and access resources if they are specified as relevant to the set tasks or are specified to be used as an assessable requirement, making no distinction between non-assessable and assessable tasks. There is no exploration beyond these resources. While they recognize they need to find an impetus to learn, they appear to be unable to do this for themselves.

4.6 Relegation of primary impetus

For some learners the primary impetus to learn is relegated to a secondary role. This usually occurs when life circumstances such as illness, family commitments or work commitments reduce the amount of time the learner is able to devote to their learning. The data showed that this occurred for a number of participants. The primary impetus that is relegated is one of interest or high achievement, and is replaced by an assessment impetus or achievement to pass impetus. Given that the analysis of the interest impetus

as described above shows a propensity for exploration, which requires considerable time resources, it is not surprising that time-poor learners will sublimate this impetus for one that requires less time allocation while still enabling success in the unit to occur. This is also true of those with a high achievement impetus that has to be replaced with a pass achievement impetus. In this case it is exchanging the desire to go beyond the assessment requirements and engage in extra activity, with one of completion of the assessment work to the level that is possible within the time frame available.

For some learners, as in William's case, the primary interest is almost totally subsumed by the need to complete work in an extremely time-poor environment. He is a student with work and family commitments who is very much aware of this factor.

> [My responsibility] is obviously to get the best mark as I can, and I did have this idea that I would try and go for HD's [high distinctions] but that's gone out the window because of other things that I have had on this semester. … I used to try and get things done in plenty of time. Life's changed a bit, and it's got more difficult. Now we're down to the "just in time" method. Which I know is not the best. It's not my ideal way of doing it but that's basically the way things are at the moment. Time's an issue. (William)

These comments shows that he is aware he has another impetus to learn and preferred ways of working, but is unable to follow that preference. In his interview he regularly referred to time constraints, restricting his work effort, and following guidelines provided by the lecturer as his mechanism to get the essential work done as shown in this comment below.

> William: … If they give an indication like that I'll do whichever way they say, but if they don't I'll normally read the text first. I'll read the chapter in the text because usually they've got an overview rather than getting down into detail, so I'll read that first and then I'll have a look at the readings.

> Interviewer: And then after you've read, what do you do then?
> William: Not very much, because usually that's about all my time gone.

Like those with a high achievement impetus, William is aware of the need to tap into a range of resources to extend his understanding of the unit. He referred to the readings, the asynchronous forum and the library all as mechanisms for finding out more about the unit. However, due to the time constraints, there is always a qualifying comment about the use of these resources.

> There's the forum and there's, the lecturers provide and put most things there, so that's been a good decision compared to subjects where there hasn't been [one]. There's always the library. There's plenty of material out there. … I use the textbook and the readings, of course. I don't use the forum all that much because at home, it just takes me a while with logging on, by the time you go through all the processes and then try and read everybody's messages. (William)

Here we see the acknowledgement of extra resources, but a limiting of their use due to time constraints, which now determines the construction of his environment as one resembling much more that of a pass achievement impetus learner, where the environment is constructed to get the necessary work done. His environment is, however, different from the pass achievement learner in a few critical ways. He does try to utilize resources to further his learning, and there is no sense of using these features only to check if he is "heading in the right direction". In fact, in other units, he made use of alternate media forms (i.e. audio tapes) that enabled him to make effective use of his time on work trips to further his learning.

Veronica and Anne are other learners who exhibit a relegation or restriction of their primary impetus. In these cases the primary impetus is interest, with a secondary impetus of assessment. This is demonstrated in their responses when asked about their responsibility in the unit.

> It was one of a number of psych subjects that I needed to choose from, so it appealed to me in terms of the topic. … I think as a student I have a responsibility to, um, to complete the coursework that's set down. I think I'm cheating myself and my lecturer if I don't put in the work in order to gain a full understanding of this subject, so I do have a responsibility as a student to do the work that's set out. (Veronica)

> It certainly opened me up to more reading and things like that - different interpretations of it [the integrated curriculum] and applications of it. …As a student I have certain requirements that I have to do, but we are doing a project as well as part of our assessment tasks and I guess my responsibility there is to take what I have learnt and to adapt it to a situation and then possibly hand it on to others. So my responsibility is to be explicit and to be well researched and to have a thorough understanding of it. (Anne)

These comments show that the two impetuses are quite intertwined for these learners. There is the sense of interest in the unit and gaining a full understanding, while at the same time a need to complete set work. For Veronica in particular, there appeared to be a tension between these two impetuses that was exhibited throughout her interview, with the interest impetus driving a desire to learn being constrained by time and circumstances which caused a relegation of her interest impetus, forcing an engagement of the assessment impetus.

> This topic fascinates me. Out of all the topics that I've done, I would say this is the jewel, if you like. But it's happened where some personal things have happened … so I feel that as interesting as this subject it, I feel that I no longer have the time to really get into it and enjoy it. … I just want to finish it and it's almost as if I'm just doing enough to get through now, whereas before it was, you know, do the best that I can. (Veronica)

Here we see this tension of the interest impetus countered with the completion of the assessable work when the impetus is assessment. This is also present for Anne, but is more to do with her own control of time for exploration countered with a need to complete the necessary work to succeed in the unit.

> If I'm interested [in a unit] it can be all-consuming. It can tend to become all-consuming. … then I think well, this is a compulsory unit. I have to do it, I have to get on and do it. (Anne)

This tension also manifests in the construction of their learning environments, where they both use a wide range of resources (e.g. the asynchronous forum, readings provided, additional library resources and the internet, discussion with others). This is what one would expect of a learner with an interest impetus. However, because of their need to focus on assessment, the exploration of the unit and the subsequent use of resources is restricted to, or focused on, assessable work, as can be seen in the comments below.

> Interviewer: Do you add anything yourself to what's already provided?
> Veronica: In terms of research for assignments and things like that yes. Talking to people in the field, I have a contact that I work with, people that I can speak to about different subjects. I contribute to the forum, just based on stuff that I read. But usually, given that I'm a DE [distance education] student and I'm trying to work as well as study, there's not, I don't normally have the luxury of going further into the content than what's recommended by the resources, as much as I would like to.

> Interviewer: Tell me a bit about what other things you've used that you've added to what's already there.
> Anne: I guess part of it is imagination. The project that we are doing we sort of are working with a group of three, and we had an idea and we've sort of, you know, each input from everybody. … Further investigation, be it on the Internet or in the library, which we can use with our project or

> put it away for later on. Just talking with the lecturers, with fellow students and things like that also helps.

There always appears to be a desire to explore and to build a learning environment that supports this, but the framework is now set up to restrict that exploration with a specific boundary of the assessable work. For these learners, for whom the primary impetus has been relegated to a secondary role due to external or internal constraints, we see an environment that matches their primary impetus, but is restricted to the narrower focus of completion of the required work.

4.7 Summary of primary impetus to learn

The following table (Table 9) shows a summary of the six sub-categories for the impetus to learn driver, highlighting the features of the environment and their construction and use. As can be seen there is considerable overlap between the career, interest and high achievement categories, and again between the assessment, pass achievement and unfocused categories, despite a different focus for the impetus to learn in each of these groups.

Table 9: Summary of the six sub-categories of the impetus to learn driver and their impact on the environment

Impetus to Learn	**Provided environment**			**Communication networks**	**Connection with the lecturer**	**Additional Resources**
	Textbook and lectures	**Online communication facilities**	**Other resources**			
Career	Used as foundation resources	Used minimally or not at all	Used fully	Created with work colleagues outside university	No specific connection - used minimally for assistance	Add extra resources from work environment
Interest	Starting point and trigger for further exploration	Used if comfortable with the technology	Used fully	Formed with those with a common interest – particularly with family and friends	Looked for interest connection from the lecturer	Extensive range of additional resources – used media that was most familiar
Assessment	Used to further assessable work	Used to check progress and that they are "on the right track"	Used only if relevant to the assessment	Used for assistance with assessable work – usually with students enrolled in the unit	No specific connection - used to clarify assessable requirements	Rarely used – only if necessary for assessable work
Achievement - high	No distinction between these resources and other provided resources	Used if familiar and furthered the work of the unit	Utilizes all resources that will help attain a higher grade	Used for clarification and further discussion – often with those within the unit, but may be external also	No specific connection – used mainly to clarify understanding	Wide range of extra resources used for clarification and work extension - , using media that was most familiar
Achievement - pass	To provide fundamentals and ensure they are doing what is necessary to pass	Only used if needed to complete necessary components of the unit	Used only to complete work to a pass level	Used order to complete the necessary work and assistance in completing that work – internal to unit	Used to ensure they are doing what is necessary to pass	Rarely used – only if necessary to complete work for the unit
Unfocused	Used as directed because they are provided	Only used if directed to use and are necessary to complete the set tasks and assessable work	Used if directed to use them and they further the set work of the unit	Used only if part of a formal task – e.g. a group assignment	Used to provide direction to complete set tasks	Not used unless directed to use them to complete assessable work

5 Chapter Five – Self-perceived Technology Ability

With the nature of tertiary education increasingly supported through the use of information technologies, particularly for the online learning environment, an important aspect that impacts on the learner's construction of their environment is that of their ability to use the technology. Dabbagh (2007) indicated that being "skilled in the use of online technologies, particularly communication and collaborative technologies" (p. 221) is seen as a necessary characteristic of the successful online learner. But what is meant by technological skill? Maddux (2004) indicates that "what exactly makes up computer aptitude is not known, but it is probably a complex combination of attitude, skills, experience, and certain personality traits as well" (p. 30). Koohang (2004) explored the experience aspect of technological skill, and found that students who had more prior experience with the Internet rated the aspects of usability (i.e. simplicity, user-friendliness, user control, readability, navigability, appropriateness of presentation design, load time, information relevancy and organization) higher than those with less experience. He also found that learners who spent more time using the e-learning courseware rated aspects of usability more highly than those who spent less time. Liu, Maddux and Johnson (2004) investigated the attitude aspect of technological skill, looking at the relationship between students' computer attitudes and their success in learning computer technology. They identified an intermediate variable – time spent on learning technology, which sat between positive attitudes and higher learning achievement. That is, students who have more positive attitudes towards technology (in terms of enjoyment, motivation, importance and freedom from anxiety) tend to spend more time using it and subsequently have higher levels of achievement. Schrum and Hong (2002) also sought to identify characteristics of successful online learners. They found that access to the technology and a higher level of comfort in using the technology were factors that contributed to success in online environment. An aspect of technology skill that is closely related to comfort level and attitude is that of the learner's self-perception of their ability. This can have considerable impact on the construction and use of their learning environment. A positive attitude and high self-perception of one's abilities can be a powerful enabler, regardless of the level of competence. Conversely, low self-perception of one's technical competence can

discourage the use of technology. This was found to be the case for students in a Masters course using a WebCT environment for file handling and discussion, despite an attempt to provide technical tuition (Goodell & Yusko, 2005).

It is this aspect – the self-perception of the learner's technology ability – that is the second driver for the construction and use of the learner's learning environment that is under examination in this thesis. Table 10 shows the self-perceived technology ability of each of the participants as established through the criteria outlined in Section 3.8 of this thesis.

Technologies in this study are those associated with both the online environment and offline computing technologies. Online technologies include communication technologies (e.g. email, asynchronous forums and online synchronous chat) and technologies for information retrieval (e.g. World Wide Web/Internet and the online databases and online journal access). Offline technologies include computer software such as Microsoft Word and PowerPoint and specially created CD-ROMs for use with a unit.

In this chapter, a number of technological issues that have an impact on the construction and use of the learner's learning environment will be examined across the five levels of self-perceived technology ability using the interview data of the participants.

5.1 Attitude to technology and technological resources – value, relevance and use

This study's findings suggest that when the self-perceived ability in using technology is low, the confidence in using the technology is similarly low, which reduces the value of the technology for the learner. This then impacts on the use of the technology, keeping the familiarity of the technology low which further reduces the self-perceived ability, thus becoming a self-perpetuating cycle. This is supported by Drennan, Kennedy and Pisarski's (2005) who found that perceptions of the usefulness of technology and flexible learning were important in the satisfaction of using it.

Table 10: The self-perceived technology ability of participants in the study

Self perceived technology ability	**Unit**	**Name**
Low	Child Development	Mandy
	Indonesian	Kaitlin
		Luke
		Yolande
	Integrated curriculum	Anne
		Janet
	Psychopathology	Ben
		Samantha
	Technology for Education	Angela
Low to Medium	Child Development	No participants
	Indonesian	Julia
		Jocelyn
	Integrated Curriculum	Joan
		June
		Kirstie
	Psychopathology	No participants
	Technology for Education	No participants
Medium	Child Development	No participants
	Indonesian	Barbara
	Integrated Curriculum	Catherine
		Donald
	Psychopathology	Harriet
		Patrick
		Tanya
		Veronica
		William
	Technology for Education	Harold
Medium to High	Child Development	Astrid
		Brett
		Patricia
	Indonesian	No participants
	Integrated Curriculum	No participants
	Psychopathology	Janice
	Technology for Education	No participants
High	Child Development	Derek
	Indonesian	No participants
	Integrated Curriculum	Claudia
		Esther
		Rachel
	Psychopathology	Phillip
	Technology for Education	No participants
Not classified	Psychopathology	Elizabeth

At the extreme end of the spectrum are those learners who don't know how to use the technology at all. As a consequence, they don't see its relevance to their learning, and hence avoid any use of technology to support their learning. Luke, a learner with low self-perceived technology ability described this situation when he commented:

> We didn't really go into depth on how to use the MUSO site [Monash University's WebCT Vista site] or anything like that, so I kind of feel even though it's there and we've got the potential to use it, no-one really has taken advantage of it because no-one's really interested in using it, except off-campus students. … the environment they've given us is both the classroom and the online, given kind of the MUSO site as the discussion product, or what it was, which I for one, didn't know how to use and secondly didn't want to use. (Luke)

Luke indicated he didn't know how to use the site and felt he didn't get adequate instruction on how to use it. As a consequence he attached no value to its use and assigned similar attitudes to his fellow learners. This also extended to other technologies, where he made similar comments about the difficulty in using the CD provided for the unit, and hence devalued any learning associated with it.

> It doesn't seem like anyone actually gets anything out of the CD's, so I think I've lost my CD and I don't really care any more, because I never had to use it and it doesn't seem to actually impact negatively on the class. We don't seem to talk about them at all. I don't even know if we're meant to use the CD. (Luke)

Here we see a total disengagement from incorporating the technology into his learning environment, and hence there is no subsequent learning related to the unit content that might have occurred if these technologies were employed.

Others with low self-perceived technology ability see their learning revolving around the technology, with the requirement to master the technology taking up considerable time, and, in some cases, becoming all-consuming. As a consequence this becomes a barrier to their learning in the unit. This is evident in Joan's comment regarding the aims and objectives of the Integrated Curriculum unit.

> From what I can gather, a lot of us are sort of very mixed up about the whole thing. We really can't understand the link with ICT either with this unit. We're just sort of feeling that this unit's very much an Information Technology unit rather than a curriculum unit … because we're spending hours and hours and hours in front of the computer doing activities. (Joan)

For Joan, the learning and use of the technology has become all-consuming with learning revolving around the technology aspects and associated activities, rather than the actual content of those activities and how this related to the topic areas of the Integrated Curriculum unit. By contrast, Rachel, who has a high level of self-perceived technology ability, sees the technology aspects of the unit enhancing and supporting her learning about Integrated Curriculum.

> The WebCT online thing. There's information on integrated curriculum for example. There's the bulletin board so we can communicate with other students. The other stuff in WebCT. … What else do I make use of? For doing our project, a lot of IT outside of WebCT. … Word for typing up essays and web pages because we have to do a presentation so we've decided we're going to do it in web page format, so we've been doing mind maps and stuff and saving them as web pages. I think we're going to use FrontPage at the end of it. (Rachel)

Rachel's comment about the resources available shows that her impression of the technology is one of providing her with the necessary tools to seek out information and complete assessable work for the unit, rather than a focus on the technology itself.

Unlike the person with low self-perceived technology ability, for whom the learning focus is on the technology, Rachel talks about her learning focus as the activities and work of the unit, with the technology purely as a vehicle to aid that learning, and not about learning the use of the technology itself.

While some learners with low levels of self-perceived technology ability are willing to tackle the technology and do not have difficulty mastering it, their lack of self-confidence, coupled with the time-consuming aspect of learning to use the technology, still presents a barrier to its use as can be seen in both Kaitlin and Julia's comments.

> I find I spend, I'm not very good with computers so … I find I spend a lot of time trying to work it out as well, like going 'Oh, what button do I press' and I get technical problems … and then I have to go and research how to do it first. … Once I do know how to do it all it, yeah, it's really easy, so it's just a matter of getting over that first. … I don't feel too intellectually challenged by it. I just see it as maybe an obstacle rather than a difficulty. (Kaitlin)

> I didn't make use of the online chat to the degree that I could've or should've and that was, I don't know that it was any conscious decision. I found last semester extraordinarily difficult with personal commitments … so mine became more a time of "Ok. I want to do this for myself. I need to do that for work. I need to marry those together. Let's do it in the quickest, simplest way. If we find online chat time, well and good. If we don't well we just don't do it this week." So it became more a priority thing. (Julia)

Here we see that time becomes a barrier to the use of technology for Julia and Kaitlin; this is not present for those with a high level of perceived technology ability who actively seek out the use of technology.

> I have offered to do a lot of the IT work [for the group project] because that's the fun bit for me. I like IT and organizing and stuff like that. So I offer to do that. (Rachel)

> I read it [journal article] on screen, mostly. I often edit it or highlight it on Word. You can do everything on Word that you can on paper, except sort of carry it around. (Phillip)

> The most common [resource] I used for my own learning is getting on the computer and looking stuff up. … It's accessible and because I'm on the computer I can get my thoughts down straight away. If I see something, I can download it, you know, store it in a folder where I can later access it - that sort of stuff. So I guess because it's convenient and I'm not wasting any time in that I'm getting stuff down straight away. (Derek)

Rachel, Phillip and Derek, all with high levels of self-perceived technology ability, actively incorporate the technology into their learning environment, viewing it as an enhancement to their learning. Rather than being considered a time burden, these learners see the technology as a time saver that facilitates their learning.

Another barrier to the use of technology for those with a low level of self-perceived technology ability relates to those who have had prior negative experiences with the use of technology. This has caused them to have a negative attitude to the technology, which in turn impacts on their subsequent use. A number of participants with a low level of self-perceived ability with the technology had had such experiences.

> It always worries me, that stuff. Any time I've ever got on the Net and typed in something a little strange, there's all this porno garbage comes up, and I don't want to know about it. I just find that the Internet seems to be riddled with that garbage. (Ben)

> Well I'm not fond of the technology aspect of it. I guess part of that is from past experience. We also had to do a similar type of thing in first year and I don't miss it. (Anne)

> … in our first year we all had to do technology for a unit and we spent hours and hours and hours in front of the computer doing little minor tasks all the way through. Some of them were way out of our field of experience that we'd never done before and so we were all very, very challenged by it and I think a lot of us sort of freaked out with it too. … So I don't think it's the unit itself [and the use of technology that's a problem]. I think it's just our previous experiences that are being reflected here. (Joan)

> Like last week we had a quiz, like an assessment quiz that we had to do, and a funny thing actually happened. I clicked on the practice one and I thought OK I'll whiz through it to see how I go before I do my readings just to see where I'm at. Then when I went to do the actual test it said I'd already completed it so rather than emailing my lecturer I went straight to see him and he formatted it a little bit differently and, yeah, it had gone through as though I'd done the actual assessment, and I got 50%, which I suppose was OK if I'd just whizzed through it without thinking, but, so he only just took it off the program and said just re-sit it. So I re-sit it when I was really fatigued and I took too much time and I actually got 45%, so things like that I find kind of strange. I don't think if I was learning in my usual way that that could have happened. (Angela)

As a consequence of these experiences their use of technology is restricted. Ben only accessed Web sites he knew and trusted, limiting his search for information to the electronic databases and journals; Anne and Joan used the technology for required activities within the unit but indicated a clear preference for face-to-face rather than online communication; and Angela restricted her use of the technology to information gathering. Those with a high level of self-perceived technology ability related no such experiences.

For those with a low level of perceived technology ability, the barriers described above tend to limit their use of the technology, restricting these learners to using technologies they are familiar with. As a consequence, they never really tap into the potential of the technology-supported online environment.

> I think they did try to do something in real-time, but I'm not into that. I can't do it. … I'm really not comfortable with computers. … I'm a face-to-face person. I really don't like to send emails and talk over the computer. I'd rather see somebody face-to-face. (Mandy)

Here we see Mandy's lack of comfort with computers placing a barrier on her use of the computer as a communication tool. Samantha also tended to use the computer mainly for offline use such as word processing which she was comfortable with, avoiding the use of the online communication features that she had little, if any, experience with.

> I'm not a person who would ever go into a chat room or anything. My daughter had MSN messenger on there and I still haven't worked out how you would use the thing. But that's not me, I'd much rather talk to somebody than play. To my mind the computer is a tool … it's not a form of entertainment. … Again, as I said, I rarely put anything up [on the asynchronous forum]. Someone the other day, it wasn't anything academic, someone said 'I don't know when the exams are.' I rang them early and said the exam's on this time and this [place]. (Samantha)

Samantha placed the online chat aspect of technology in the realm of games and entertainment rather than as a communication environment to aid her studies, thus avoiding its use. Even for the asynchronous online environment she resorted to a more familiar form of communication (i.e. telephone) to respond to a question rather than use the online communication medium itself. For her, there is a sense that the online technology environment has not been recognized as a communication medium in the same way as face-to-face or phone communication.

As knowledge of, and familiarity with, the technology grows, so the level of self-perceived ability grows and hence the technology is valued more.

> I'm becoming a lot more aware of what you can do with the computer and being online … I'm looking at a very narrow look at online information and that's just because of my knowledge. If I had a greater knowledge, I'm sure that I would appreciate online much more. (June)

June started to recognize the opportunities that technology can provide as she became more familiar with its use. Julia, a learner with low to medium self-perceived technology ability, also began to realize the capabilities of the technology for the unit, especially in what was provided on the supporting CD-Rom.

> I'm not a technology learner, which was my big struggle, and one of my very first things was trying to get my head around how to use this CD. … There's usually a conversation on the CD so we can listen to what it sounds like. And the lecturer's been very clever in doing that as well, in that it's a native speaker on the CD as well as someone who is Australian speaking Indonesian. So you get to hear how it should sound if you're a native speaker, but what is acceptable as an Australian speaking Indonesian, which I think is very, very clever. … The CD travels with me between school and home. And it's something I'll often do of a lunchtime is just put the CD on in my office as I'm doing stuff so that I'm hearing the bits and pieces. (Julia)

After her initial struggle with using and operating the technology for the CD-Rom, Julia came to recognize the value of what had been provided, and, as a consequence, began to incorporate this technology into her learning environment on a routine basis.

For those with a higher perceived level of ability and familiarity, this recognition of the value of technology is well embedded in their learning practices, and the incorporation

of technology has become a time saver and a mechanism to allow more flexible study practices rather than a barrier and something to avoid. Astrid saw the technology not only as a tool for information retrieval, but also for email communication within her work environment, with computer use overlapping both leisure and work time. Brett and Derek both used the Internet extensively as another information resource and as a tool, with Derek running an online business.

> I use that [the Internet] as my exclusive resource. (Brett)
>
> I use the Net comprehensively when I'm doing research on theories and practical issues as well. … I found if there was a specific journal article which I would have to go into the library or somewhere else to find I would often bypass that. I prefer the full text versions online. (Derek)
>
> The face-to-face we probably find ourselves sometimes getting a little bit off the track. Um, so, whereas email was generally fairly specific … Whereas, you know, [when] you'd say the same sort of thing in the face-to-face you might get someone who decides to crack a joke… you might find in fifteen minutes you still haven't actually addressed what you were trying to talk about. So, you know, I mean, the face-to-face is always good because it's far more personal but it can sometimes be a little bit more time consuming. (Derek)
>
> Well I like it [the online environment] because it's a convenient way of communicating with other people and learning and um, because of the time convenience because you can do it when it suits you. (Astrid)

As we can see, the technology is now referred to as a convenient resource to be used comprehensively and exclusively. It is seen as a time saver and an easier option than following up with hard copy versions of information or face-to-face communication.

In summary, we see that when the level of self-perceived technology ability is lower, the familiarity with the resources available through technology is also lower. This increases the likelihood that the learner will not value the resource or recognize its potential, seeing it as a barrier to learning rather than a benefit, thus leading to its omission from their learning environment.

5.2 Use of the World Wide Web as an information resource

Those learners with higher levels of self-perceived technology ability were more inclined to use the Web as an information resource, rather than using academic online databases or searching in the library for print-based versions. They demonstrated a familiarity with, and confident use of, the Web, that enabled them to find and authenticate information in this arena.

> I guess if there was a specific journal article that I know of … then I would go to some of the journal articles … I would sometimes use Google too … In fact, sometimes you find, where in the journal citation is says you've got to go and get the hard copy I'd actually find a full text version through Google, even though the actual Education database wouldn't have the full text version. (Derek)

> In terms of assignments I just looked up my own resources on the Internet. I used that as my exclusive resource. … I try to avoid them [journal databases], just a hassle to look through, like online still I'm talking about. (Brett)

> That's what I like about it [the Web]. Like I'll be sitting there, and I might just be staring at the wall and going [pause here to illustrate thinking], and an idea will be coming out and suddenly I've just searched and two seconds later I've got the bit of information I want. So that's put it so far above the library that it's not funny. Like [in] your library you might have that, two days later you might eventually get to the library and then you have to pull out ten books [and go] through the pages. (Brett)

> We decided it'd probably be good to start off before we even got to that stage, for the children to work out what type of learner they are. I've been sort of looking online on the weekend with perhaps little things that the kids could do to do stuff, but there's nothing really specifically aimed at lower secondary or upper primary school which is the area that we're looking at that I felt that they'd be able to do and understand. It was all just very technical so I thought yeah, OK, well we might leave that. I'll go and have a look in the library, there might be something that we could photocopy and scan in. (Claudia)

Here we see a sense of reluctance to use less familiar forms of information sources such as online journal databases or the print-based materials in the library. They are seen as less likely to provide what they are looking for, or as a time-consuming form of information retrieval, and are only used as a last resort when information cannot be found via the Web.

For others with a lower level of perceived technology ability, authentication becomes an issue. These learners had less confidence in the authenticity of the material, or their ability to determine this, and so tended to use those forms of information they considered more trustworthy, such as journal articles found through electronic databases or actual print material in the University library.

> I don't really go onto the web site all that much unless I can't find much in the way of books and articles, because I think you can get web stuff from anywhere. You don't really know whose writing it is, and if that is supported, if that is true, and so then your work could be affected by that. (Barbara)

> I rarely go on the Internet to find information, because I'm not good at being able to tell what's good and what's not good. And I only feel very, very comfortable with using information on the Internet if I'm using official sites. (Yolande)

> I can't reference them [information resources] off the Internet. … It's frowned upon, and I don't really like doing it either, because you can't trust them [the authenticity of the resources]. … I physically go to the library and if I need anything I'll do it there. (Luke)

Barbara, Yolande and Luke's comments all illustrate this wariness of the authenticity of materials on the Web. As a user with medium self-perceived technology ability, Barbara uses mainly books and journal articles, accessing the journals via the online database library system, only accessing information on the Web as a last resort. She has an awareness of the possible lack of authenticity of web materials, but her confidence in her own ability to authenticate the material is less than for those who have a high level of self-perceived technology ability. Yolande, a learner with a low level of self-perceived technology ability, similarly has difficulty authenticating information and will only use information from trusted sites that she knows are authentic. Luke, also a learner with a low level of self-perceived technology ability, limits his access of information to those he can retrieve directly as physical resources in the library.

Those with a medium level of self-perceived technology ability tended to use the Web to gain a general overview only of a topic area, rather than as actual reference material, as can be seen by the following comments.

> I search on the Internet for, sometimes to get a background of what's going on in the field. You know, sometimes the news reports will give you a lead. (Patrick)

> I go to the Internet, to the Web; find information. Then if I find articles and that there that might be interesting and I start to get a clearer picture of what I'm really looking for on a topic then I might go and try and find stuff in the library. (Tanya)

> Interviewer: You don't get on the normal Web or things like that?

> Veronica: I have started to do that, just to get a general, like very general, not necessarily academic information. Just to see what else is out there, but I normally rely on, um, on journals and papers and things like that.

There is a sense here, for these learners, that the Web can provide information. However, as they have less confidence than those with higher levels of self-perceived technology ability in the authenticity of the material, or their ability to determine this, they tended not to rely on this information as a formal reference source, preferring to use those forms of information they considered more trustworthy, such as journal articles found through electronic databases or actual print material in the University library. Despite this lack of confidence in the authenticity of the material from the Web, they do show a more sophisticated use of the technology than those with lower levels of self-perceived technology ability. This is evident in their ability to search for information on the Web, and their willingness use the Web as an information resource to gain an overview, following up with a technology-based information source they regard as higher quality. This approach is not as confident as that demonstrated by those with a high level of self-perceived ability, who will move seamlessly between the Web and online databases, confident of the validity and reliability of the information regardless of its source, and showing an ability to search easily for the relevant information in both environments.

This highlights another barrier to the use of information from the Web for learners with a lower level of self-perceived technology ability. Those with low to medium self-perceived technology ability found their inability to search effectively on the Web, without bringing up large amounts of irrelevant information, became a barrier to its use. As a consequence they tended to revert to using the familiar forms of books and articles found in the library.

> Interviewer: But mainly books and those sorts of things?
> Julia: Yeah, mainly books.
> Interviewer: You don't use the Internet?

> Julia: Beginning to. I've learnt how to look things up. As I say, not terribly technologically, um, competent or confident. …The Internet's separate. I tend to do an Internet time, now that I'm learning how it works. … The Internet was this whole, brand new thing to me where I had to know what it was that I was looking for first because I was very specific. Sorry, less specific. … I'm getting better at being able to target that instead of, you know, typing in "Indonesia" and then finding there's 7000 hits and then going, "Oh. I'd better try that one and that one" and ping ponging my way around.
>
> Interviewer: What sort of things are provided both online and in the face-to-face environment to, as a sort of assistance, or that helps you form part of your learning environment?
> Joan: Suggested readings that you get in the unit outline. I find them very, very good. Sometimes the lecturers will suggest perhaps you could you know look up certain things. I don't know; a lot of it I just tend to go off myself. Off to the library.
> Interviewer: In the online environment what facilities are available?
> Joan: I just go to Google and to the databases and do web searches and information searches that way. And I probably pull down heaps of useless information. There's probably a better way to do it.

Julia found searching on the Internet time-consuming as her searching was not targeted enough. She also found herself distracted by accessing and following hyperlinks on a site. Joan also felt her effective use of the search engines was compromised by her lack of ability. She did try to use both the Web and database search engines but preferred to be directed to specific references in the library. Others avoided the use of the Web entirely for their study.

> Ben: Very valuable [the online journal databases] because you have easy access - you don't have to go to a library. You can find the material far easier [than] on the Net, I find.

> Interviewer: And those websites are to do with PsychInfo and those things?
> Ben: Yes … And you can avoid all the garbage on the Net.
> Interviewer: Because they're academic databases rather than websites?
> Ben: Yeah.
>
> I find that I waste, I don't know whether it's just because my skills are bad on the computer, I'm not very good, um, but I waste too much time on the computer, you know, trying to locate things. I did use the education databases and try and locate things, um, but, you know, I could waste a whole afternoon doing that so I'd rather go to the ladies in the library [the librarians] and say "I need something on this topic", you know, and they pull up a whole lot of things in five minutes and I'm off; I'm right. Whereas, you know, I did spend afternoons on the computer thinking "Oh, I'm just wasting my time." (Mandy)
>
> We've got a WebCT that's got articles on there that you can read. So it's a good resource but I haven't used it. Also, I suppose, just the tutes, you know, discussions and that, but they always suggest books that you can look at for further reading. (Janet)

Ben, Mandy and Janet, all with a low level of self-perceived technology ability, avoided the use of the Web with varying levels of disassociation. Ben did use the online environment via the online academic databases in order to access physical books and journal articles, but avoided the Web entirely for his studies as he saw it as being of poor quality. For Mandy, the Web wasn't even a consideration as she found using the online databases difficult enough, and for Janet she relied solely on word of mouth information for referencing, avoiding the use of the online environment for her information gathering entirely.

In summary, the Web as an information resource is used far more extensively as a resource by those with a high level of self-perceived technology ability, who have confidence in their ability to find accurate information in a timely manner. Those of

lower self-perceived technology ability use the Web less, or not at all, lacking confidence in their ability to determine the quality of information, or finding it too time-consuming to locate the information they needed.

5.3 Use of hard-copy versus electronic formats

The use of hard-copy versus electronic format material was not clear cut, as most learners preferred to print the readings and articles rather than reading them on the computer screen. This is supported by Hatch (2002), who found in a survey of 127 student respondents that 91% printed the study material provided in HTML format; of these, 72% indicated they would be prepared to pay for the provision of printed notes. Reasons cited for printing included difficulty with on-screen reading, lack of accessibility of materials away from the computer, internet download problems and the ability to mark documents directly (e.g. highlight, add comments). The following comments show this preference for printed material.

> I don't read off the screen. Too old to read off the screen. I print everything. (Samantha)

> I definitely print them [journal articles] out so that I can highlight and write all over them and things like that, yeah. (Barbara)

> I print off the journal articles because it's easier to have them you know, in hard copy. … I'd rather be able to, for some reason I'd rather be able to sit and sort of, at my leisure, go through articles and things like [that], because a lot of them are so long. I find if I'm sitting there reading for long periods of time I 'm not taking it in as much, and you've got to take down notes. I like to be able to highlight something. (Janice)

> I find that really hard work to read off the computer screen, so I've got to print everything and then read it. Then I can go over it and highlight it and do what I need to do. (Claudia)

Here we see four learners from four different levels of self-perceived technology ability (low, medium, medium to high and high respectively) all indicating their preference for the hard-copy materials. The main difference occurred in the capture of the materials. Those with lower levels of self-perceived technology ability appeared to print directly from the online environment, while those with a higher level of self-perceived technology ability tended to download the materials first, printing off-line at a later, more convenient time or location.

> I like to have the paper in my hand, so if the reading is online I will print them off. (Anne)
>
> Most usually I'll download them and then I'll take them to work and I'll print them all off and, um, and it's sort of after I've printed them off, often that I'll go through a more serious cull of what's useful and what's not; because I find it easier to have tangible things. (Tanya)
>
> Interviewer: Do you read them [reference articles] online or do you print them off?
> Derek: Well, it depends I will scan through them, so if the full text is available online I'll generally download it straight away into a folder at which point I will then scan through it, very quickly scan through it, so I'm not, I wouldn't say I'm reading it, just scan through to see if there's anything that looks as though it's popping up that could be used for usefulness. So, and then print it. … Scan through them electronically, and then print up those that could be really valuable.
>
> Interviewer: Do you print out a lot for yourself, generally?
> Phillip: No, I usually keep it on disc. I won't waste my money on ink. I think I'd prefer to have it on paper. I'm a bit old-fashioned. I like paper, but there's just so much of it, you know. I can't afford all the ink.
> Interviewer: So do you print out some of them, or do you tend to read it all online, or, I mean read it, you know on the computer?

> Phillip: Yeah, I read it on screen, mostly. I often edit it or highlight it on Word.

Here we see Anne, who has a low level of self-perceived technology ability, printing from the online environment, while Tanya, with medium self-perceived technology ability, will download first and then print off at a convenient location. Derek, a learner with a high level of self-perceived technology ability, goes one step further and carries out some selection prior to printing, while Phillip, also a learner with a high level of self-perceived technology ability, downloads and then reads on-screen, even to the extent of editing electronically.

There is a greater differentiation between the levels of self-perceived technology ability in the use of hard-copy versus electronic formats when investigating the development of written materials: the lower the level of self-perceived technology ability, the greater the tendency to work in hard-copy format.

> I don't really use it until I'm actually writing. If I'm writing a, say for example, mostly do notes and research and that sort of thing. Writing essays, the final part, I do that on the computer. Other than that I don't use the computer much. (Luke)

> I probably am used to having like physical technology in front of me like pieces of paper with like my written work rather than online. (Angela)

> I just, even an assignment, I type an assignment, I check it all up on the computer but I will never send one until I've actually printed it down, got a red pen out and actually read it and liked the look of it on the bit of paper: pick up all those things I don't notice on the computer. (Samantha)

As can be seen with the comments above, those with a low level of self-perceived technology ability tend to work with pen and paper and then transfer it to the electronic

environment, as this is required for submitted work. Even Samantha, who does develop her written material on the computer, still needs the hard-copy version to feel assured that the work is satisfactory for submission. For some of the learners in this group, the need to work with pen and paper extended beyond the development of their assignment submissions and included both online tasks and comments for posting to the online asynchronous discussion forum, as can be seen from the responses below.

> I usually print off the computer what I need to do and then take it home [WebCT based activities], look at it, and go through it myself, if you get what I mean. … And do it, write it out in my … notebook and then I go back to WebCT and complete. (Janet)

> Interviewer: With the discussion forum, can you tell me a bit about your participation and style of posting in that?
> Mandy: Look, I, because I'm not comfortable with doing that, I simply, what I did was I wrote out a couple of question by hand beforehand and you know, clarifying my thought and trying to lead a discussion in where I thought it was going, sort of thing, and then I went on and typed them in and left it at that.

These comments show considerable lack of comfort in the technology environment, when tasks meant to be completed online are worked in pen and paper first. This level of discomfort appears to impact upon the thought processes needed for writing development. However, in Mandy's case, it is unclear from the data whether this lack of comfort is due entirely to the use of the technology medium itself (i.e. the mechanics of using an asynchronous forum) or the nature of the communication that is occurring via that form.

By contrast, those with a higher level of self-perceived technology ability (Tanya and Patrick with medium self-perceived technology ability and Derek with high) have integrated the electronic formats into their environment to a greater extent, developing their writing on the computer.

> I don't often write a lot on paper. I go straight to the computer and I'll start writing um, dot points; important points on the computer. And then I'll start to work on those points and develop them into an essay or if it's a report, similar sort of stuff. And I'll start to develop those ideas. (Tanya)

> I like to download them in text form and I take notes by copying and pasting, you know. And then I have a sort of succinct collection of articles in say 10 pages and then from that I like to go and write my essay, and that. Little quotes and things, you know. (Patrick)

> So I guess when I'm doing an assignment or any other sort of set work I guess that my first point, my starting point is usually always my computer – a blank Word document where I can start writing down, you know, getting some information from some of the theories, some of the resources, uh, you know, if I see points that I feel are important I'll generally type them straight in so I've got them as a you know, a point of reference. (Derek)

Their comments show a tendency to have the electronic form as the starting point for development, using electronic resources and their own material to build their final submission.

In summary, for the use of hard-copy versus electronic forms, most learners prefer the printed form for reading, but those with higher self-perceived technology ability will download and print offline, with some learners culling electronically before printing. For the development of written materials, those with lower levels of self-perceived technology ability generally prefer to work with pen and paper during the construction phase, transferring to the computer for the final document, while those with a higher level of self-perceived technology ability work directly in electronic form.

5.4 Computer-mediated communication (CMC)

The use of computer-mediated communication (CMC) has become a regular feature of most university units, both for on-campus studies and distance education environments. CMC includes email, asynchronous communication as bulletin boards and discussion forums, and synchronous chat environments. These vary from CMC provided by the University (e.g. email), optional CMC provided within the unit, CMC incorporated as a compulsory part of a unit and those CMC environments added by the learner (e.g. MSN messenger). How much such communication forms will be incorporated into a learner's learning environment will be influenced by a learner's attitudes, beliefs and experience (Curtis & Lawson, 2001; Krendl, Ware, Reid, & Warren, 1996). Such beliefs include their self-perceived technology ability. This impacts on not only their use of the various communication forms, but also their connectedness to others and privacy issues within the online CMC environment.

5.4.1 Use of computer-mediated communication

For those learners with a lower level of self-perceived technology ability, the preference was for face-to-face communication with CMC being used minimally, if at all. The following comments are typical of these learners.

> I kind of feel even though it's there and we've got the potential to use it [CMC], no-one really has taken advantage of it because no-one's really interested in using it except the off-campus students. (Luke)

> Probably not use it unless I was forced to (Anne)

> I tend not to use the online environment. I don't like looking at it that much, as far as communicating here with uni and the forum and all that kind of thing people talk about. (Ben)

> I'm still, I'm a face person. I really don't like to send emails and talk over the computer. I'd rather see somebody face-to-face. (Mandy)

> There's communication with other students at the campus and that was face-to-face and I used those because it was a good chance to practice our skills in a real life situation. (Jocelyn)

> I haven't used email or anything yet. I just haven't had the need yet. I know I'd rather go and see the lecturer and ask him face-to-face, if I had a question or a problem. … Perhaps you get more details if you go and speak to someone rather than replying to an email. Maybe they don't have time to sit down and write a detailed email, whereas if you go and speak to someone, it doesn't take as much time to sit down and have a quick conversation about something. (Kate Mahoney)

> I don't very often email. I'd rather come in face-to-face. (Joan)

All these learners, with either low or low to medium self-perceived technology ability, showed a reluctance to engage in communication in the online environment, preferring to seek out face-to-face communication. This reluctance extended to all forms of CMC, including emails, asynchronous and synchronous discussion environments.

For the asynchronous discussion environment, some of these learners avoided this completely, while others tended to be passive users, only reading what others had written and not actively contributing themselves.

> I look at the forum. I'm not a great person to put a lot on it, but it's interesting. (Samantha)

> I only use it [the forum] to judge how um, the rest of the class, like what the rest of the class is actually doing. … I haven't actually written anything. (Luke)

> Basically you see what [they've written], and I love to see how other people summarize, how they interpreted it. So yeah, it helps me with my

> work as well, so it's sort of like a research thing, like "Oh how did he [the lecturer] do that?" (Kaitlin)

They saw the benefit of viewing what others have written and how this might help their learning, but were reluctant to participate themselves. This reluctance to use this form of communication included the online asynchronous forum environment and email, with these learners preferring face-to-face or phone contact for discussion or assistance from lecturers.

> There's also an emotional ambiguity with the Internet and I think sometimes people don't really understand what tone you've taken when you're talking to them over the Internet [using CMC] because it's just words. So I do like to talk to someone directly about it rather than email them. (Luke)

> Phoning up lecturers and saying "I don't understand this." … [I prefer] face-to-face because it's instant, it's there, it's portable, it's more expressive than perhaps typing an email. (Anne)

> I would prefer face-to-face, if I could. After that it's phone calls. … I really liked that, being able to sit down and go "What on earth does this question mean?" over a cup of coffee, and just have a talk. (Samantha)

> I probably prefer not online. I think interaction is important in that it gives a more fluent discussion. Ideas flow rather than you might read something and then think about it and then go back whereas each time you want to discuss something on the WebCT [discussion forum] you need to get online, you need to then do it; whereas in a classroom situation you're actually all there and available to discuss it. … It doesn't seem to take as much effort as it does to type something out and to get other people to respond to it online. (June)

There is a sense from these learners that they find the asynchronous CMC environment open to misinterpretation and find it difficult to carry on a coherent discussion. This, together with the lack of visual cues and immediacy deterred them from using such forms unless they had no alternative (i.e the use was compulsory) or its use enabled a specific objective not achievable via face-to-face means (e.g. the passing of documents via email for group assignments).

> Interviewer: What do you actually use the email for?
> June: Oh, communication – "How's this going?" With group work "I've found this and this and this, and this is a portion of the essay or assignment I'm doing and I'd like to tackle and has anybody else got any further information on that point?" and let them know if I've found such and such it might help them with their part of it. Just to catch up to make appointment times to maybe meet.
>
> I'd go face-to-face with my lecturers to address a problem. Only if it was a weekend or something then I'd email. (Angela)
>
> I asked a couple of questions to the lecturer and so there was email, mainly for asking information and what I have to do for a specific thing. (Jocelyn)

Here we see the use of email only in specific situations – for information sharing, making meeting times, when the lecturer is unavailable face-to-face, or when very specific information is required that is not open to misinterpretation or does not require a lengthy explanation. The synchronous CMC environment was almost universally not used by these learners.

As the level of self-perceived ability increases, so the use of CMC increases, first with the more familiar form of email.

> I email him [the lecturer] a lot with some questions … I'll be more likely to send him an email to say I don't understand instead of posting it to everyone and saying "can anyone help?" (Barbara)

> I'm very much an email person. I use it continuously. I email other students to ask them stuff by their name. (Harold)

Here we see those with a medium level of self-perceived technology ability quite comfortable with the use of email, employing it frequently. There is, however, still some reluctance regarding the use of the asynchronous discussion forum as a substitute for face-to-face discussion. This is usually a less familiar form of CMC than email and so a lower level of confidence in using the medium is reflected in the learners' comments.

> I've made a very conscious effort to try and get on the forum more often, but I still find it a very difficult place. It'll be easier after res [residential] school because you know the people that are talking, but before res school I find it very difficult to communicate with people. And although I might go on and read every now and then, I don't participate in the actual forum. (Tanya)

> I've looked at [the asynchronous discussion] and put in a few messages and had no replies to anything so I can't be bothered. It seems more like a hit and miss toy. (Harold)

> Yeah, I have, yeah. Not very much but I've certainly checked it to see what is there and I think I've asked a couple of questions but you know, not heaps. (Harriet)

> In other units I've had to email lecturers or contact them by phone … The forum seems to be addressing any questions that I have or you know, just getting a feel for how everyone else is tracking as well. (Veronica)

Unlike those with the lower level of self-perceived technology ability, we can see from these comments that these learners with a medium level of self-perceived technology ability have made the effort to use the asynchronous discussion, and that there is a small amount of active participation. There is, however, still a sense that these learners are not fully comfortable in using this form of communication, and some are still only passive users of the medium. As for the learners with low and low to medium levels of self-perceived technology ability, there was little if any use of the synchronous chat medium.

This increase in the use of the asynchronous discussion environment continues for those with medium to high levels of self-perceived technology ability.

> I like to put something, kind of a bit, um, little message or a little point of view that's a little bit controversial and just try and stir the pot a little bit. And then I get a few responses, some of them negative, some of them positive, and it's easy on the forum to do that because it's anonymous. (Patrick)

> I found I did it most days and I found I needed to do that. There was [sic] a lot of postings on there and if you did tend to miss a couple of days there was just so much to catch up on. … I would post a few other times [other than for assessment requirements] whenever I felt, you know, there was something interesting or, you know, someone was on the right, the same track or one might have a bit of information that linked with what someone was saying, so you'd tell them about where you'd found a bit more information about that area. (Astrid)

> I used to use the discussion forum a lot. Not only mine [the forum for her character in the role-play] but other people's to get ideas. I didn't so much use my email because I talked to people. … I'm always looking at discussions on the Internet because um, a lot of emphasis is put on that so a lot of people do use it so you get a lot out of it if you do use it because you've got everyone else's ideas and things on it. … I'd nut out, I'd look at Phoebe's role [the central character in the PBL scenario] and

> I'd look at the main points and I'd put them on the discussion. "This is what I think I would focus on. I think these are the points." … I'd post up my things and then someone'd reply "Oh that sounds great. Did you think of this?" (Patricia)

Here we see a more active participation in the asynchronous discussion by these learners, who see this as a medium where they can share their ideas and promote discussion.

When the use of CMC is investigated for those with a high level of self-perceived technology ability, they were far more likely to use CMC as an integral part of their learning environment.

> I use um, the forums, email, messenger almost exclusively. I've never written a letter. I've made a few phone calls – only a couple. They all just seem easier and they're um, you can keep a record of them. You know you've done them. (Phillip)

> Basically email to my friends if there's [sic] any questions I might want to ask them without going through the bulletin board. (Esther)

> Derek: I guess I actually preferred just your normal email. …
> Interviewer: How did that compare with the face-to-face communication of the group?
> Derek: Oh well, the face-to-face we probably find ourselves sometimes getting a little off-track. … I mean the face-to-face is always good because it's far more personal but it can sometimes be a little more time consuming.

> One day last week we just found a computer and we were all on computers and just emailing each other information. (Claudia)

Rather than avoiding the use of the technology, they have incorporated it into their normal mode of communication, often using it in preference to other forms. There was also some inclusion of synchronous forms of communication.

In summary, for this area of computer-mediated communication, we see an increase in its use as the level of self-perceived technology ability increases. As familiarity and confidence in using the technology increases, so use progresses from minimal or no use at the lowest levels of self-perceived technology ability, to a full integration of such media forms at the highest level of self-perceived technology ability.

5.4.2 Level of connectedness to others online

Given the nature of the use of CMC as shown in the previous section, the connectedness to others in the online environment follows a similar pattern – less connectedness for the lower levels of self-perceived technology ability, with the connectedness to others online increasing as the level of self-perceived technology ability increases. For those with a low level of self-perceived technology ability like Yolande and Ben, who did not use the asynchronous discussion environment, there is consequently no connection at all to those in the online environment. There is also little connection for those with this low level of self-perceived technology ability who did use the asynchronous discussion environment, as can be seen from the following comments.

> Interviewer: How connected do you feel to other students and the teacher in that online environment?
> Anne: Not really, because it's not that face-to-face thing.

> I prefer to be in a group you know, because you can't get a good discussion going, I don't believe, online. I think that it's better to be in a group where you can see each other's faces and you can clearly communicate. … You sort of weren't as connected as maybe if you're face-to-face with someone. (Janet)

> Probably not that really connected. … It's [the online environment] a foreign place for me (Angela)

> I chose the ones I read by who wrote them. You know, I didn't read anybody that I didn't value their opinion. … I didn't reply at all to any of them. I guess that was something I could have done but it's just not me. The computer is not me. … I didn't feel the need to respond. I didn't feel that I needed to let them know I was there or had read what they had to say, and I didn't expect anybody to do the same with mine you know. I didn't even bother to go in to see if anybody answered my questions. (Mandy).

For Anne and Janet, the visual and non-verbal cues that are normally present for face-to-face communication, but are lacking in the online environment, heighten the lack of connectedness with others in this environment. Mandy's comment seems to indicate she did not expect to feel connected in this environment, and hence made no effort to generate any sort of relationship with those posting messages or responding to her comments.

For those with a low to medium or medium level of self-perceived technology ability, there is still some sense of disconnectedness.

> … to the other students, not much, other than the ones also on this campus. … The ones on campus I feel quite connected to because we got together [face-to-face] most weeks to discuss things. (Jocelyn)

> Online-wise not a lot … Other students, not terribly connected. Nice to be able to put faces to names [after meeting at the residential] and that was about it. (Julia)

> Joan: I don't feel very connected with many of the students at all really. … I'm only probably connected to half a dozen students here.

Interviewer: So those ones that you are connected to – they are much more connected in the face-to-face environment than in the online environment?
Joan: Yes.

And that [the relationship] comes from when you meet the person face-to-face or after the first time you speak to someone. So on the forum, because it's all text you don't actually hear the person's voice, you still feel very detached. (Tanya)

If this was first year I wouldn't feel any connection with them at all, but because I can kind of see the name and oh, I know the person and I have experiences to draw on. But over the [asynchronous discussion], the actual act of doing it there isn't much connection really there at all. … It doesn't really give much sense of them personally. … that's basically it – responding to what they've written. I don't really take into, their personality or anything I know about them into consideration. (Donald)

Barbara: No, not really … I see them in the video-conferencing but I wouldn't know their name. I don't know anything about them, and when you do go up and have a look at the online things, you think, well I don't know who that person is.
Interviewer: What if you saw a name of somebody who was in your class? Is the reaction different?
Barbara: Yes, it's like "Oh" you know sort of, I wonder what they've put up … I'd be immediately drawn to it. I would go straight to it. For example when we post up the activities for the CD, I would purposely go and look for ones from people in my class. I will not go for anybody else from the other campuses. I will look for the people that have, um, to see if mine was the same as theirs because I feel like I can go to them later on and say, "well why did you do that differently to mine?"

The nature of the reason for the disconnectedness has, however, changed somewhat. Rather than a disconnect being apparent when using all forms of CMC, the disconnect is now focused on those using the asynchronous discussion environment that are not known from the face-to-face environment.

Once the level of self-perceived technology ability is higher (i.e. medium to high or high), the level of connectedness is still influenced by whether others are known in the online environment. The main difference here is that their level of self-perceived technology ability has not impacted on their participation. They are still more likely to engage in using CMC as an active participant.

> Well, pre-residential I think, listening to them talk to each other on the forum. Listening, reading them talk to each other on the forum, when someone would so "oh I'm from Victoria" or "I'm from Tasmania" or whatever, I think that's interesting, because it makes you go "Oh, look having people from different areas" so you'd sort of feel, I found that interesting. And post residential, I know I'll know faces to names on the forum which is good. Um, it wouldn't tempt me to more to write on the forum now, even though I know who they are, but it means that I can picture who's saying it. (Janice)

> … the people online, we know who they are because we've had, we've got other units together and we've been with each other for four years. So we know who they are and you find there's a lot of personal comments on there so, like between friends or from other people, there's a lot of personal comments. So it does stay fairly together and connected. … you can put sort of a face to that name that they've put up. (Esther)

> I've got two or three friends. One lives in Wagga and I visit every second month and the others are all on [MSN] messenger. I get on them as often as we can; we have a yarn, compare notes. (Phillip - high)

> … for our [assignment] group, so yeah, I felt that that was well connected, but the actual rooms for each stakeholder, mm, I don't know how connected we felt. … it was almost like sitting in the lecture theatre with a whole lot of online people and just every now and then someone would say "Well I think it could be this" or "I think it could be that" so you're hearing it, you're taking it in, but you're not actually really connected to it so much. … I probably did about 5 or 6 postings all up, but you know, and about half of which were my own thoughts and half were commenting on others – two or three of each. (Derek)

Here we see that Janice and Esther both feel well connected to others in the online environment as a result of their face-to-face contact with others, but this doesn't appear to have impacted on their use of the online environment. Phillip treats the level of connectedness equally for those he has met face-to-face and for those only connecting via the online synchronous medium. Even when the other users of the online environment are not known personally, or the sense of connectedness is not great, there does not appear to be any change in the way the CMC is used. This is the case for Derek, who, while not feeling particularly connected, still used the asynchronous discussion as an active participant.

For some the level of connection to others made no difference, regardless of the way the connection was developed, online or face-to-face.

> It doesn't really matter that you don't know their name or you do know their name. … I've read people's messages that I knew, but I would go out and read them and see what they've written like just out of curiosity anyway. And, but there was no difference to whether you knew the person or didn't. Not to me anyway. (Brett)

> Interviewer: Ok. How connected do you feel to the other students in that online environment?
> Patricia: Yeah, pretty well connected. Like you'd have space. People wrote pages, um, and because you know them as well, like in, if you saw

> a posting and you saw them, you could discuss it anyway. So yeah, I thought it was really well done in that way. I thought, yeah, you definitely can communicate with virtually anyone you want to.
> Interviewer: Right. But you already knew these people well from your two or three years?
> Patricia: Oh not all. I got to know people from the different psychologists [her character in the PBL scenario]. Like this girl used to post things, and I didn't actually know who she was but I found out she was in my friend's group, so I went and talked to her about it, and we posted each other all the time.
> Interviewer: So the online connection prompted you to speak to her face-to-face?
> Patricia: Yeah, definitely.

Brett's response is the same for all users, with the content of the message causing his response rather than his connectedness to others. Patricia's response in her follow-up face-to-face with someone she first made contact with online is perhaps more interesting, in that it is the opposite of the usual trend where the face-to-face contact helps to establish the relationship that is then continued online. It is possible that the pedagogy of the unit and its role in establishing the nature of the asynchronous discussion environment, where those with a common role in the PBL scenario come together for online discussion, has had some influence on this process. This pedagogical influence will be explored later in the discussion chapter.

In summary, for those with lower levels of self-perceived technology ability, the sense of disconnectedness appeared to match their lack of use of CMC. As the level of self-perceived technology ability increased, there was a sense of looking for connectedness with others for whom a relationship had already been established, to enable a more active participation in the online environment. For those with the highest levels of self-perceived technology ability, there was a sense that the level of connectedness with others made little difference to their level of participation in the online environment.

5.4.3 Privacy issues

Privacy is also an issue that impacts on the use of the communication media within the learner's learning environment. Tu (2000) found that

> when students perceived a medium as more public, the level of social presence is lower, and vice versa on a medium that is perceived as more private. Students perceived e-mail communication as more private than bulletin board (p. 1665)

and that "e-mail messages with a long recipient list that preceded the body of the message were perceived as impolite because e-mail is supposed to be a more personal communication" (p. 1665). Privacy appeared to be a concern for the majority of all learners, regardless of their self-perceived level of ability, however the impact on the environment was quite different.

For those with lower self-perceived technology ability, there is a sense that the discussion type forums, both asynchronous and synchronous, were too public. These learners felt uncomfortable revealing too much of themselves or opening themselves up for critique.

> I wouldn't personally get on the forum and tell you all about me. … I'm not a person who would ever go into a chat room or anything. (Samantha)

> I don't actually use the message board. I'm not ready for people's slander. (Luke)

> June: … I'm doing group interaction work, so I often meet with people. Either by the phone or emails, or possibly meet in the mature age lounge or something like that.
> Interviewer: So you use email as an alternative?
> June: Yes.

> Interviewer: How do you find that in comparison with, say, the chat or the forums?
> June: Probably a little bit more personal. I think email's not accessible to everyone. I think if you email to a specific person or group, then that's who gets it. Rather with the forums or the chat rooms, whoever's on there gets it.

There appears to be a concern here for these learners that anyone will be able to see your responses in the online discussion environments, which will not happen in either the face-to-face environment or by using email. This may also relate to the learner's sense of connectedness to others online being lower than those with a higher level of self-perceived technology ability. This often made these learners avoid using the discussion forums altogether or limited their use to passive participation, with face-to-face being used as the preferred form of communication.

> Samantha: I look at the forum. I'm not a great person to put a lot on it, but it's interesting.
> Interviewer: Any synchronous sort of chat or things like that?
> Samantha: No.
> Interviewer: What about face-to-face?
> Samantha: If there was someone up in my area who was doing a subject, yeah, I would get together. … I believe that that's great. If you can sit down and discuss the question with somebody.

There is a hesitation to comment in the online environment, which does not appear to be present in the face-to-face environment. This may be due to the familiarity of the face-to-face medium, the relationship already established with the other person in the face-to-face environment, or perhaps the written nature of the technology medium that gives a sense of permanency in any responses contributed.

There was also inhibition about commenting on other's work, as can be seen in Kaitlin's remark below.

> Sometimes I get self-conscious about analyzing other people's work as well, because I don't want to offend anyone. So I think "Oh, I'll just talk to [lecturer's name] about that." ... I don't want someone thinking 'Oh, you know, she's such a bitch.' (Kaitlin)

Kaitlin was commenting here on her reluctance to critique other students' use of Indonesian when written in the asynchronous online forum, indicating she would rather query the possible mistakes privately with the lecturer than comment publicly to the other students. While it is unclear whether this reluctance stems from her lack of comfortableness with using the technology medium, or just her unwillingness to comment on another student's possible mistakes, there does appear to be some consideration of the public nature of the forum and how others might view her comments when written there. This response is supported by Curtis and Lawson's research (2001), which found that "when one student disagrees with the contribution of another: rather than express disagreement 'publicly' through the class discussion list or conference forum, critical comments were offered privately" (p. 25).

For those with higher perceived technology ability, there is still a privacy concern. However their way of solving it is to use other forms of technology that are considered less public.

> Email was the preferred way. And that was good because sometimes, if we put together some ideas, we could email the whole group as well. And then sometimes if something was just relevant to one of the stakeholders we could, you know, email each other about something specific. (Astrid)

> I guess I actually preferred just your normal email. Um, while the asynchronous chat was valuable because you're actually getting views from the similar stakeholders but within other groups, um, I don't know that everyone was as forthcoming in that environment because they are

> being looked, you know, there comments are being looked upon by others, you know, by peers who they sometimes don't know or don't know very well. ... I think you can just express more and be a bit more personal with just your normal email. (Derek)

Astrid preferred email because it gave her control over who saw the information. Derek preferred using technology rather than face-to-face discussion because of its convenience, and used email rather than the forum for group discussions because of these privacy concerns. He did indicate he would have used a private forum if it had been available, as he saw the forum structure as better able to facilitate the group work than email, as is shown by this comment below.

> …it's easier [an asynchronous forum] because we've all got the same place to go instead of different email addresses going to different servers. It's all there in the one place and I guess it's then stored so that we can all access it at any time, instead of, you know, having to go back to our own inbox folders … (Derek)

In summary, privacy appears to be a concern for all learners. However, while those learners with a lower level of self-perceived technology ability tended to avoid the use of CMC, those with higher levels of self-perceived technology ability would choose a more private form of CMC.

5.5 Integration of physical and virtual environments

The general trend in relation to the integration of the physical and virtual environments was one of a greater amount of separation of the two environments at the lower levels of self-perceived technology ability, with an increase in integration as the level of self-perceived technology ability increases.

> I probably wouldn't go back down to the machine till I was ready to write. And I touch type, so sometimes I might go down if I'm not [ready to write], and I will type instead of writing by hand, … but yeah, no, it's simply, yeah, I would go upstairs, understand it, absorb it, get it all in my

> head and then I'd walk back down the stairs and then, the computer again is just a tool to write it up and send it round. … I don't read off the screen. I print everything, even an assignment. (Samantha)

> … but I don't really use it [the computer] until I'm actually writing. If I'm writing er, say for example, mostly do[ing] notes and research and that sort of thing. Writing essays, the final part, I do that on the computer. Other than that I don't use the computer much. … using one precludes the use of the other [the physical and online environments], because when I use the computer I get distracted, so I try to get rid of it as much as possible until I have to use it - especially with the Internet. (Luke)

Here we see two learners with a low level of self-perceived technology ability keeping their physical and virtual environments very separate. Samantha kept her physical learning environment (used for thinking and understanding) and virtual learning environment (used for information searching and word processing) totally separate, even having different study locations for the two environments. Luke also kept his virtual environment quite separate, allocating a separate and distinct time for virtual environment activities. Others with a low level of self-perceived technology ability saw some linkages between the virtual and physical environments, but their practical use of the two environments still appeared to be separated.

> Interviewer: Do you see any relationship between them [the online environment and the physical environment]? Any integration?
> Janet: Yeah, I can see how it links, as in like everything we do online links to what we've learnt in the lecture … So I can see how it all sort of links up.
> Interviewer: Do you find the use of one sparks use of things in the other?
> Janet: Yeah. Like we go from the lecture straight to WebCT because we know what we're going to be doing in WebCT this week is just furthering our knowledge from what we learnt in the lecture, so it does spark, you know. … It's not separate or anything.

Interviewer: Do you use online in other units? I know in this unit it's been formally set up as part of the unit, but for units where it's not, hasn't been set up, do you actually go online at all?
Janet: No, no I don't.
Interviewer: You have your own? You don't have your own computer?
Janet: Oh, I have my own computer but I don't hardly [sic] use it at all. All it's used for is typing up assignments and that's it.

Interviewer: And do you have a relationship between your online virtual environment and the physical environment? Do you see a relationship there or do you see them as two separate things.
Angela: No, I see a relationship between them definitely. I think, you know I do go into that online environment and doing that unit, I take away into the real, well into the other part, of learning what I've learnt online, so yeah, I think there's a relationship between the two.
Interviewer: Do you, when you're working in other units that aren't online, do you think ever of using online resources and things?
Angela: Yeah. Absolutely. With all the other units that I don't do online, I definitely use technologies and online things just only if it's looking up web pages or going to the library and searching the catalogue for references and books and what have you, so I think you do.

… they are all interlinked because one, for instance the textbook I've got, directly relates to the CD-ROM and then when I get online and post stuff it's in relation to what I've just read, so it's definitely integrated. … I've got a preference for something that I would have done [already] over something else, which means I always go to the textbook first, because I really like to have everything in front of me and I can write stuff, so I'd do that before I'd look at the CD-ROM. … Sometimes I see them as integrated and sometimes I don't. I definitely need to use both of them. (Kaitlin)

Janet and Angela are both enrolled in units where the technology part of the unit is integral to its completion, thus the linkage between the physical and virtual

environments is already provided. Their comments indicate that the linkage between these environments occurs through what has been provided in the unit, rather than the integration of the physical and virtual environment into their own learning environment. Janet indicates that the virtual environment is not used when the onus is on her to add this to her learning environment, and Angela keeps her online activities separate. Kaitlin saw the online and physical environments as linked, but preferred to work from the familiar to the unfamiliar, and her use was somewhat separated, using first the physical environment and then the electronic environment.

This separation persisted for those with low to medium levels of self-perceived technology ability.

> Interviewer: How integrated is your physical environment with the online environment?
> Jocelyn: Not really. Most of the time the online environment for me is very separate. I think that's why I struggle to use it all of the time. If something's on there I actually like to write it down myself, so that I've got a copy of it that I can look at any time.
>
> I think perhaps they're separate. I definitely see that, in this unit, I see that as a separate component of the unit. So that's something that I have to do once a week to get 25% of my mark or whatever it is, so I don't really see it as being linked to the work that I'm doing in a group as the assignment. (Kirstie)
>
> Interviewer: OK. How do you see the relationship between that environment and your physical environment? Do you see any connection with them or is it just "I'm doing it because it's part of the course."
> Joan: I only do it because it's part of the course. … I think maybe it's my age. I dunno. Whatever, I think yeah, probably because I don't feel as comfortable with the computers.
> Interviewer: So for you they're sort of separated in a way?

> Joan: Yes. They are. Very separated, yeah.
>
> Um, that room actually has, we have a network in our home, a computer network in our home, so I can be on the Internet all the time. So I just set the laptop up at the start and I've got a wireless connection. So as I do stuff or as I need the next step in the CD process, I can access that, come back to my table, play with it and whatever, and swing back to the computer. So I tend to be doing both things simultaneously, if that makes sense. … I actually have the CD running as well as being online at the same time. … I will ping pong between the two [WebCT and the CD], but not a lot if I'm going to use the chat stuff I tend to do it as a separate activity. It's more to have the WebCT open to send Patrick an email or do the email task for the week or whatever it happens to be rather than "oh someone's going to be on the chat line in 5 minutes. I'll need that open." … The Internet's separate. (Julia)

All these learners saw the physical and virtual as separate, with only Julia having some integration of her physical and offline virtual environments. She referred to having a network connection that enabled her to have access to the online virtual environment, but her actual use of this area was still quite separate (i.e. online chat and Internet searches).

For those with a medium level of self-perceived technology ability, we see some learners who still separate the two environments, while others have a slightly more integrated approach within their learning environment.

> I look at the test and whatever the lecturer's put in there as supplementary stuff, and then, yeah, then I'll go to the, get online, if I have time. (William – medium)
>
> Interviewer: Do you see any relationship between the online virtual environment and the physical environment?
> Catherine: For myself, no, but I reckon you could create it.

> Interviewer: Let's take this assessment item that you have to do as this multimedia development. Do you see any relationship between that and what goes on in the physical world?
> Catherine: Not really, no, because I view the multimedia as tools. I suppose there would be that linkage there, but it tends to be a bit more vague for me, I think. Yeah.
>
> Interviewer: … if you're working on something, say, on a piece of paper, and you see something and you think "Oh, that's interesting", do you get on the Net or do you sort of keep working through the paper stuff and then go and look at it later?
> Tanya: No, I'd probably get on the Net. Yeah.
> Interviewer: Right. So they're fairly well integrated together?
> Tanya: Yeah. I guess so.
>
> No, they are integrated because I suppose, yeah, I tend to do use the Internet just for my, you know, activities that you might have done in other ways in paying your bills and you know, obviously now studying and just searching information, booking like flights and, so in a sense they are integrated in my normal activities, so it's not like it's an event to get on the, turn the computer on. (Harriet)

For William and Catherine they are more separated, while Tanya and Harriet have begun some integration. There is, however, even for Tanya and Harriet, some hesitancy about their integration. Harriet in particular sees the use of the online environment for study as part of her general use of the online environment, but there is still no real sense that this use is fully incorporated with her learning environment.

For those with higher levels (medium to high and high) of self-perceived ability we now start to see a fuller integration of the two environments, with the online virtual environment becoming an integral part of the learner's learning environment.

> I'm definitely like that. I um, I use both at once. Like I'll be at my desk and I'll definitely keep, like I said, I keep the Internet on, so if I need something I'll go to the Internet and look it up. I'm always going from one to the other. (Patricia)
>
> Well the computer's pivotal certainly … That's why I've got a really nice computer, so that I, you know, and the Internet just, you know, I wouldn't not do a subject, a study without the Internet in a way. … I'll go to both [the physical and virtual environments]. Like I'll look at this and then compare it to that and then I'll get bored looking at the computer. … Then I'll go to a book (Janice)
>
> If it's a set text book that we must refer to, I'll always refer to that generally first, but when it comes to finding further reading, um, finding our own information, finding our own resources, absolutely, online is always the preferred port of call. … You'll often find in the reference section [of the textbook] there'll be, um, web sites listed where you can keep going, so you know, yeah, absolutely, one feeds the other, and the same the other way. I mean, you find some information on the Net and they'll reference an actual textbook, which you can then go and find and use as well. (Derek)
>
> Interviewer: Do you see any relationship between your physical environment and the virtual environment?
> Claudia: In a way I do because like I've got my filing cabinets with my files and things that I can pull out and do the same in an online setting. And I've got books and you can do the online thing.

In Patricia and Janice's case (both with medium to high levels of self-perceived technology ability) we see a fluid swapping between the virtual and the physical with no conscious separation of the two. Derek, with a high level of self-perceived technology ability, also demonstrates this level of integration, with the use of information in one environment triggering the use of information in the other. Claudia, also with a high

level of self-perceived technology ability, recognized features and structures available in both the physical and virtual environments and so was more able to transfer easily between one environment and the other.

Some learners have moved to a predominant use of the virtual environment.

> It's a one-stop shop. … , I use like Mozilla or Firefox, so I'll have tabs open so I might, if I'm doing an assignment usually I'll have the WebCT or MUSO or similar open in the one tab and all my other stuff's going on in another [tab], so I can, if I have something, then I might just pop back there for a second to check something, whether it be, you know, a lecture, when you look at a lecture thing, it might be or something like that, or, for any reason, you know. So I usually do have that, usually I'm a regular looking at it and having it open and stuff like that. Checking my emails, things like that, so. (Brett)

> … the vast bit, nearly all of it happens on screen for me, you know. It is the one little world. You know, I go and switch the computer on and the library's [online access is] in it and the subject's in it and all the discs I've copied I can pop into it. It's all very much one little world to me. … You can meet people there [online], you know, messenger and things. … I read the newspapers on the Web every day. … I never think about the physical University. (Phillip)

Brett, with a medium to high level of perceived technology ability, saw the virtual environment, accessed through the learning management system WebCT, as his primary learning environment, providing most of the features needed for his study. Phillip, a learner with a high level of self-perceived technology ability, is perhaps the most adapted to the electronic world, preferring to work almost exclusively in the virtual environment.

In summary, as the level of self-perceived technology ability increases, there is a gradual move to incorporate the virtual environment to a greater extent within the learner's learning environment. Those with the lowest levels of self-perceived technology ability tend to keep the virtual and physical environment quite separate. Those with the highest levels of self-perceived ability have a seamless integration of the two environments, while those learner having intermediate levels of self-perceived technology ability have a level of integration somewhere in between.

5.6 Impact of computer access at home

For a few learners, the lack of computer access at home impacts on the construction of their learning environment. This lack of access tends to cause a separation of the physical and virtual environments, or a conscious decision to use a particular type of computer-mediated communication (i.e. asynchronous rather than synchronous communication).

> I study at home and I access the online environment at work, so if I need to research an assignment I'll work back after work and do my research then. They've given me Internet access to be able to do that and they've also got fast access. My computer at home is very slow. (Veronica - medium)

> I prefer to do it on a bulletin board, which I prefer to have been given some sort of thing to go home and think about it and then formulate something at home then just post it. I think, I don't like the idea of having to sit there for an hour and half in a chat room and do it then and there. … I have to be here and do it and I really don't like to sit in the computer labs here. They're not exactly the nicest of things. … here [at University] you're not relaxed at all, you're just getting the job done. At home you would do it when you wanted to do it. You'd maybe have the whole weekend to do it or it could be anytime. It could be 12 o'clock at night when you're doing it. Here I've got to do it and it's usually the end of the day, so I just want to go home and it's all to do with the circumstances, it's not so much what you have to do. (Donald)

> I've got access to computers here at the Uni. Getting computers isn't that hard here, because I don't have a computer or anything at home. So that's been all right to do it at Uni after lectures or whatever. … More the bulletin boards because I don't have them at home. I've been having to do it in my own time and basically when I can get onto it. So if I went to use a chat there's probably no-one else online at the time, so the bulletin board you can post it and everyone'll see it anyway. (Esther – high)

For Veronica, a learner with medium self-perceived technology ability, the online access is only available through her work, so anything requiring online access is done there. This causes a separation of the virtual and physical environments which is out of her control. For Donald, also with medium self-perceived technology ability, his lack of computing access at home also caused his physical and virtual environments to be separate. He also made a conscious choice to use the asynchronous online discussion rather than the synchronous chat. He appeared to be affected by the physical environment when using the computer, which had the effect of reducing his CMC participation. He did think this might change if he obtained computer access at home. Esther, a learner with high self-perceived technology ability, also indicated a preference for the asynchronous medium as she did not have computing access at home. The main difference for her, however, is that this lack of access does not appear to have impacted on her use of the online environment, which is consistent with the higher use of CMC for those learners with a higher level of self-perceived technology ability.

5.7 Summary of self-perceived level of technology ability

Table 11 shows a summary of the five levels of self-perceived technology ability, highlighting the aspects of technology use as it impacts on the features of the learner's learning environment. As the level of self-perceived technology ability increases, there is an increase in the valuing of the technology medium, and subsequently a more positive attitude that results in its increased use and greater integration into the learner's learning environment. Also, as the level of self-perceived technology increases, the confidence in the validity, reliability and authenticity of the information provided

through such technological media increases. As a consequence, its use increases, and even surpasses, other more traditional media forms such as print and face-to-face communication.

Table 11: Summary of the impact of self-perceived technology ability on a learner's environment

Level of self-perceived technology ability	Attitude to technology	Information resources		Computer mediated communication	Integration of Physical and Virtual environments
		Use of Web	Hard copy vs electronic		
Low	Lowest – little or no value, relevance or use. Barriers include learning the technology, time constraints, past negative experiences.	Not used as an information resource – concerns about ability to authenticate and quality of material.	Prefers print – everything printed. Tends to print from online copy. Prefers paper medium for written Development.	Prefers face-to-face. Little or no use of CMC. Passive participants in asynchronous forum. No use of synchronous medium. Low or no connectedness to others. Discussion forums too public.	Quite separate. Only see linkages when it is provided.
Low to medium	Starting to recognize the potential of technology but still some barriers to its use.	Difficulty in effective searching a barrier. Also authentication issues.		Uses email only if face-to-face not available. Passive participation in asynchronous discussion. Low connectedness to others. Discussion forums too public.	Quite separate.
Medium	Attitude more positive and gradually seeing its potential although still some ambivalence.	Used to get an overview, but not as specific reference material.	Tends to print from offline copy. Will develop written material on computer.	Greater use of email. Prefer face-to-face for discussion – mainly passive participation in asynchronous discussion. Connectedness to others when face-to-face relationship is present.	Some integration of the two environments.
Medium to High	See technology useful and convenient.	Confident use – will use as a reference.	Will cull in electronic form before printing. Commences development of written material on computer.	More active participation in asynchronous discussion. Level of connectedness doesn't impact participation. Privacy issues resolved by using email.	Fluid movement between environments. Computer often starting point and pivotal. Some use virtual as sole environment.
High	See technology as useful, accessible, saving time and integral to their learning.	Confident use – first port of call, uses in preference to other sources.		Incorporated CMC into environment – high use of email, active participation in asynchronous discussion, some use of synchronous chat. Level of connectedness doesn't impact participation. Privacy issue resolved by using email.	

6 Chapter Six – Personality Type

It has long been recognized that learners have preferred ways of learning (Keefe, 1987), and that these preferred ways usually refer to the more innate or stable characteristics of the learner. When a learner engages in a specific learning experience, he or she will adopt particular learning approaches or strategies, and these approaches will be influenced by the learner's learning preferences. Biggs (1988) succinctly describes learning strategies as "the learning processes that emerge from students' perceptions of the academic task, as influenced by their personal characteristics" (p. 185). These strategies will, in turn, impact on the construction of the learner's learning environment for that particular learning experience, therefore it is reasonable to investigate a learner's learning preferences and its impact on the construction and use of the learner's learning environment. For the purpose of this study, personality type, as identified using the Myers-Briggs Type Indicator® (Myers & Myers, 1998), provides a way of determining learning preferences that fall into both cognitive (ways of perceiving the world) and affective (ways of making decisions) categories. The MBTI® is described in detail in Section 3.6.4 titled "The Myers-Briggs Type Indicator®".

As detailed in Section 3.5, each of the participants in the study completed the MBTI®. Their MBTI® personality type is shown in Table 12 together with the unit of study they are enrolled in. The personality type is shown as the coded letters of the type, followed in parentheses by the clarity of the preference, where each preference letter relates to each dimension respectively. The clarity of preference is represented by: S – slight preference; M – moderate preference; C – clear preference; and V – very clear preference.

For example, Anne's personality type is shown as ESTJ (MSCC). This indicates her preference for Extraversion (E) is moderate, her preference for Sensing perception (S) is slight, her preference for Thinking judgment (T) is clear and her Judging orientation (J) shows a clear preference.

Table 12: Myers-Briggs Type Indicator® personality type for participants in the study

Name	**Personality type (clarity)**	**Unit**
Anne	ESTJ (MSCC)	Integrated curriculum
Astrid	INFP (SMSS)	Child Development
Angela	ENFP (VCSV)	Technology for Education
Brett	INFP (CMSC)	Child Development
Barbara	ISFJ (MMCV)	Indonesian
Ben	ISFJ (MSSC)	Psychopathology
Catherine	ISTJ (CSMM)	Integrated curriculum
Claudia	ESTJ (MSMS)	Integrated curriculum
Donald	INTJ (SMSM)	Integrated Curriculum
Derek	ISTJ (VMCC)	Child Development
Esther	ENFP (SMMC)	Integrated Curriculum
Elizabeth	ESFJ (SVSV)	Psychopathology
Harold	ESFJ (SSMM)	Technology for Education
Harriet	INFP (MCSS)	Psychopathology
Janet	ISFP (CCCV)	Integrated Curriculum
Janice	Did not complete	Psychopathology
Julia	ESFJ (MCCV)	Indonesian
Joan	ENFP (VMSC)	Integrated curriculum
Jocelyn	ISFJ (CCCM)	Indonesian
June	ENFP (CSSC)	Integrated curriculum
Kirstie	ENFJ (VCVM)	Integrated Curriculum
Kaitlin	ENFP (VMCC)	Indonesian
Luke	INTP (SMCV)	Indonesian
Mandy	ENFP (SCMS)	Child Development
Patrick	INFJ (SVSC)	Psychopathology
Phillip	INFP (VCMC)	Psychopathology
Patricia	ENFJ (MSCC)	Child Development
Rachel	INFJ (MMVC)	Integrated curriculum
Samantha	INFJ (CMMS)	Psychopathology
Tanya	ESTJ (CMCC)	Psychopathology
Veronica	ENFJ (MMMC)	Psychopathology
William	INFP (SMSC)	Psychopathology
Yolande	ENFP (VCVC)	Indonesian

In this chapter, each of the four dimensions of the MBTI® will be examined in turn, taking into account aspects of dominant and secondary functions where relevant to the analysis of these dimensions (see Chapter Three – sections "The four dimensions of personality type" and "Dominant and secondary functions" for a detailed explanation of these facets of the MBTI®). The personality type and the interview data of the

participants are examined to determine how each of these dimensions shaped the construction and use of the learner's learning environment.

6.1 Focus of energy –Extraversion (E)/Introversion (I)

This dimension is about where the person focuses their attention and from where they gain their energy.

6.1.1 Extraversion

Extraverts gain their energy from the external world, so their focus of attention is on the people and things around them. Their first preference will be to connect with people, as this is where they will be energized the most. This is supported by the research of Irani, Telg, Scherler and Harrington (2003) who found that social interaction was moderately important for aspects of course performance for extraverts. As can be seen from the comments below, these learners indicate a marked preference for working with others.

> I like it [doing the oral exam in pairs]. Some of them, oh, everyone's going "Can we do it on our own?" because they're too self-conscious, but I'm like, "Oo, no, I want to have a partner there so I can feed off [them]. (Kaitlin)

> … I enjoy personally interacting with people. And I like to hear what people are saying … (June)

> One of the best experiences I had was first year politics last year, for first semester, and the best tutorial, the best way to learn in, if you're in a tutorial and the entire class is talking. And the entire class is trying to argue something and you've got some idea and you speak it out, and so what you end up having is massive ongoing talk that lasts for an hour. (Yolande)

> I like to be actively involved as a group, so it's been good. We've had different workshops and things each week where we could be involved in different things. I think that's suited me well. (Kirstie)

As can be seen from the above comments, the type of activities these learners with a preference for extraversion enjoy, and hence incorporate into their learning environments, will be those that require interaction with others. Kaitlin's comment, in particular, refers to having another person so she can *"feed off them"*, implying an energizing feature of this interaction. Sometimes this energizing process causes a distraction from their focus of study, as can be seen in Joan's and Claudia's comments below.

> I very much like to study in quiet. I hate having noise around me – being interrupted. … I had to use the computers in here with everybody else around and I found that very hard. (Joan)

> When I've got a house full of people I do quite well. I need that but I've sort of, yeah, I like the peace and quiet at times to sit down and really focus. (Claudia)

As their focus is on the world around them, this may tend to distract them when the learning focus they have is separate from what is going on around them, as is expressed in Joan's comment. Claudia recognizes that, as an extravert, she needs the energy gained from others, but that her perceiving mode (which is introverted) needs the opposite.

Because extraverts prefer to connect directly with their environment, they will prefer discussion and communication in a face-to-face environment (Opt & Loffredo, 2000; Russell, 2002). We can see this in the comments made below.

> Face-to-face I work off a lot better, because it's clearer to me. I like to marry it with facial expressions and gesture and all the rest of it. (Julia)

> Face-to-face because it's instant, it's there, it's easy, it's portable, it's more expressive than perhaps typing an email. You get the body language so you get the complete package and you are getting

> feedback there and then rather than having to wait till the email goes through or that sort of thing. (Anne)
>
> So much is lost in the translation when you try and write something. Most communication for me happens in the face-to-face because that is the body language and the interpretation. (Harold)
>
> On the forum, because it's all text, you don't actually hear the person's voice, you still feel very detached. But once you speak to them on the phone for the first time or meet them for the first time, yeah, it becomes a much more personal thing. (Tanya)
>
> The online learning not so much [as a preferred way of learning], because I would rather learn face-to-face than sit on the computer and just type something that maybe no-one else is going to take notice of or read or go back to. (Kirstie)
>
> Interviewer: What forms do you prefer? What forms of communication?
> Patricia: Um, face-to-face, so you can sit down and discuss it, because you can only say so much in an email and not nut it out with the other person. … you might find another psychologist in class that you know that's in the same role as you. Going to talk to them about it - definitely face-to-face for me.

These learners with a preference for extraversion all indicate here the need to connect directly with others. Julia, Anne, Harold and Tanya, who, in addition to their extraversion all have sensing perception, are aided by the opportunity to use their senses to read nuances that are absent in online text communication, while Kirstie and Patricia, both with intuitive perception, need the extravert's sense of direct connection with others that is not present in the online asynchronous environment.

This direct connection is continued within their classes.

> I do find it very beneficial to do these role-plays and to speak in class and to do these um, oral practices where you have to talk to each other and converse, so that's good when I'm in class. (Kaitlin)

> The prac [class] probably is the most interesting, just because it's very, you know, we actually talk to one another. … we just talk and we discuss, you know, um, just questions about the language itself. (Yolande)

> Like in teaching studies … we'd be doing De Bono's thinking hats or whatever, and we'd use that approach for something we've learned in class and we'd bring in sparkly hats of every colour and you'd go round, you'd put on a hat and you'd have to say something about that activity. (Patricia)

> I go to the lecture every week, which is optional, just if I have any questions. I find it helpful. (Angela)

These extraverted learners have all expressed a preference for a classroom environment that enables them to work actively in their extraverted mode through the various activities provided, such as role-plays, conversation activities, activities with physical props and the opportunity to ask questions.

The data also suggests that those learners with a preference for extraversion will also utilize this connection with others for other aspects of their study, and, as a result, will develop communication networks for a range of purposes.

> I find verbal communication to be the best for me. And so discussing things with students and staff verbally. …when I'm at res [residential] school, obviously lots of other students that are here, but at home I have a friend who's a qualified psychologist and although she hasn't done the same course as me, I get a lot of opportunity to discuss things with her; and counselors at school, district guidance officers that, you know,

> wherever I can get an ear basically to bash and get some feedback from them. … I observe the forum but I don't usually participate in it. (Tanya)

> A private tutor, yes. So getting him to tell me what it should look like here. Like what have you or even sharing my knowledge with him. … So there's [sic] lots that I add. I also ask a lot of, we've got two other staff members teaching Indonesian here. Ask them lots too. … talking to another student that I've got a fairly strong connection with. (Julia)

> Sometimes, depending if someone's around at the time at Uni, I might say to my friend "Look, what did you think about this question? How did you see it?" And we'll talk about it with each other. (Joan)

> I've got a few friends who are teachers, so I've guess I've been picking their brains for ideas as to what works and what doesn't work. (Claudia)

Here we see these extraverted learners engaging in discussion with their fellow students and professionals from fields related to the units they are studying. Communication networks will also be utilized for study purposes other than discussion, as shown in the following comments.

> I like to talk to people. I like a face. I do, and especially when I'm doing an essay and someone is there helping me, reading out for me, yeah, and studying together with someone. … I like to read my work out loud and get other people who don't understand anything about the topic to read it out loud too, so I can pick up where they're stumbling on, so I can fix that. (Kaitlin)

> Talking to people in the course about it [the weekly online task] before I actually go and do the online class, just to see what they're thinking and how they have interpreted what we had to do. (Angela)

> Get my material and then get my outline done and then possibly do most of it and then connect with someone that I know will read my work and then I'll read their work and just make sure that it's all on track and everything's going the way it's supposed to be going." (June)

> I did enjoy [at the residential] being able to communicate with other kids, other students … That was great, to have someone to do that [Indonesian conversations] with. (Julia)

Here we see Kaitlin, Angela and June using others to assist with assessable work, and Julia utilizing other students for her language practice. Rather than working through the tasks by themselves, their extraverted preference drives them to seek out assistance from others, both in interpreting the tasks and in completing them. Mandy has even made use of her own son and other children to check the veracity of the materials she is developing for her primary school education study, as shown below.

> I also use my child. I mean, I go to him and say, you know, "How does this sound?" or "Does this work? Can you understand this?" … I've also used other children in the street. I've gone to them and said "Does this make sense to you?" [in relation to aspects of Primary school education]. (Mandy)

We can see in these above comments that extraverts have a need to "talk things through" with others as part of their development process, whether it be discussion, language practice, essay development, assignment work or preparation of classroom activities.

While their preference is for face-to-face communication, if this is unavailable they will use alternate forms, needing communication in some form rather than none at all.

> Online – emailing lecturers when you're having problems. Or probably before that again I'd go face-to-face with my lecturers to address a

> problem. Only if it was on a weekend or something then I'd email. (Angela)

> I use email but probably not as much as you probably could, only because I like the interaction. I like the face-to-face. I use the telephone a lot with my friends talking about the units of work. (Joan)

> We used the chat room [reference here to the asynchronous discussion forum], because we didn't have the [face-to-face] communication between psychologists. We'd only have one psychologist in each group, so we needed that chat to tease out our ideas rather than talk with our group about it, because different stakeholder roles have got different things to focus on. (Patricia)

All these learners with an extraverted preference comment on using other forms of communication, but there is a sense that they would much prefer the face-to-face connection. As extraverts gain their energy from the people and things around them, they will also endeavour to connect with things in the outer world, utilizing resources that help provide the necessary connections for them.

> I'm just aware and watch out in the newspapers for something that might match up [with what I am learning in the unit]. If I happen to be talking to somebody at school, my children's school or something, and something matches up or I hear something on the news, and I'll think, "Oh, I'll go and look at that", you know. (Mandy)

> The CD travels with me between school and home. And it's something that I'll often do of a lunchtime is just put the CD on in my office as I'm doing stuff so that I'm hearing um, the bits and pieces. (Julia)

As extraverts, this connection will still relate to people through these objects. In Mandy's case it is information conveyed by others (i.e. talking to someone or listening

to the news), while Julia is specifically using the CD to listen to the recording of the people speaking the Indonesian language.

Following on from their preference for the face-to-face environment, extraverts will often feel disconnected in the online environment, particularly when using asynchronous modes of communication.

> Interviewer: How do you view the online environment? What does it mean to you?
> Kaitlin: It means to me that it's kind of lonely in a way, because I'm on my own and I'm seeking out on my own.
>
> Interviewer: How connected do you feel to other people, other students and the teacher?
> Angela: In the online class?
> Interviewer: Yes.
> Angela: Probably not really that connected.
>
> Interviewer: How connected did you feel in the online environment to other students and the teacher?
> June: Pretty disconnected actually. I don't think, it's probably my feeling towards that type of activity.
>
> I don't like having to sit in front of a computer on my own, I suppose. … It seems like there might as well not be another person there at the other end at all. (Joan)
>
> Online not at all; offline - face-to-face - quite well. … I absolutely hate it. It's totally impersonal. (Harold)
>
> I always find when I come back from a residential I've understood more about the topic and I feel more, I dunno, like I'm sort of part of a group, whereas online you still kind of feel isolated no matter how many people

> talk to you and say they're in the same situation. You still can't, you know, [see[the faces. You need the faces to make it sort of more real. (Elizabeth)

Because the actual physical connection with others is missing, the technology gets in the way of establishing a relationship with others, and the energizing process that the extravert relies on is reduced, making the communication less satisfactory. This can also occur within the synchronous environment, as indicated by Claudia's comment below.

> Claudia: Synchronous I guess you sort of get like lulled into a false sense of security that you're all there and really interacting, and of course you're not.
> Interviewer: What do you mean "Of course you're not"?
> Claudia: Well, you're not really because you're in your own home or at uni and somewhere and you're interacting but you're not. Like you can chat then you can go away and make yourself a cup of coffee or go to the loo or whatever, and come back and just continue on, and people don't [realize you've gone].

For her, even though the responses are in real time, the physical divide still impinges on her connection with others in this environment. As a consequence, these learners tend to take a more passive role in the online discussion environment, posting less and reading more. They may also try to follow up the conversation in the face-to-face environment rather than continue it online.

> I check it [the asynchronous forum] quite often. … I need to know, there's really important information on there that I need to know. … The other reason I check it regularly is because people post their, everyone's been assigned a week they have to do the episode. … I love to see how other people summarize how they've interpreted it. … I post on it myself not as frequently, because I like to, I prefer to ask questions face-to-face than over the Internet. (Kaitlin)

> Definitely take note of who's been posting. And if it's somebody that you mix with normally or know who they are, then you continue that discussion in an offline setting. (Claudia)

> I'd click on it [the link to the asynchronous discussion forum] and I'd read the discussion. I didn't so much; I think I only did four or five postings the whole time. But I read other people's ides that were on there all the time. … Like this girl used to post things, and I didn't actually know who she was but I found out she was in my friend's group, so I went and talked to her about it. (Patricia)

For these learners, the face-to-face connection is important. Kaitlin viewed what others had to say, but for her interactivity occurs face-to-face, while Claudia's face-to-face connection that already exists with the person who has posted online enabled her to continue the discussion face-to-face. Patricia used the already established relationship with a friend to make the connection with the person posting, which subsequently enabled her to have the actual conversation in the face-to-face environment, becoming an active participant rather than a passive observer of the discussion.

In summary, extraverts prefer to connect with people, enjoying activities that involve interaction with others. They have a need to talk things through as part of their learning development process, and, while they prefer face-to-face communication, they will use other forms rather than miss out. They may find technology gets in the way of the communication process, making them more passive participants in online asynchronous communication.

6.1.2 Introversion

Unlike extraverts, introverts gain their energy from their own internal world of ideas, so their focus of attention is often on what is going on inside their heads. They often prefer to learn on their own and will usually be quite independent learners.

> After I've left the class I have to then go on, do more reading, um, do more speaking in my bedroom to my mirror – that sort of thing. … I'd go

> home at night and I'd read over what we've done in the lesson that day, and I might sort of make better notes and things like [to] understand it. (Barbara)

> I quite like the idea of studying on my own to an extent. Not that I don't like interacting with other people too, but it gives me, I need a bubble around me to do it, you know. (Patrick)

> I'm not the sort of person who generally looks to others for that help. I'll try and solve it myself. (Derek)

> So, you know, how do you approach something that you know you just have a difficulty with understanding. Like it's not even, well maybe it is the basic concepts. Because in some ways I suppose I would, in that sort of situation I would sort of probably say to myself "All right my problem is because I should really be putting more effort into just reading more so that I become more familiar with the terms that I used. So sometimes I think also it's how much you actually seek help. I don't think I, where I clearly identify that it's my way I think that I actually have got a role there, the way I'm approaching the subject. I don't think I'd generally think to call to the lecturer and say "Help me". If I think that it's just more that I'm not reading [enough]. (Harriet)

These comments illustrate that introverts place a greater reliance on oneself, even when problems arise. Harriet's comment illustrates this well, in that she indicates her lack of understanding can be solved by working harder herself, rather than by seeking assistance.

As the introvert's focus is on their inner world of thoughts and ideas, they begin with thoughts and ideas, looking for information that helps them to develop and support those thoughts and ideas.

> I will start off with, I guess, with a thought or a direction I feel I want to go with it and um, brainstorm in my own mind, I generally won't write it down, but brainstorm in my own mind where I'm probably going to find out that information from and dive in and start looking for it. … I pretty much dive in fairly quickly and sort of find things that seem to express or seem to reinforce my own thoughts on that particular topic. (Derek)

> Rachel: Brainstorm about what I should answer or something. What my ideas are to start off with.
> Interviewer: And do you do that with people or by yourself?
> Rachel: Mostly by myself

> I will, if I'm really, really struggling I will look for a resource to begin with, but the rest of the time I have my idea of what I want to write or how I want to go … (Brett)

Both Derek's and Rachel's comments about brainstorming as an introvert, where the process is done internally and alone, is quite different from that of an extravert, who would do this with others (see section on extraversion earlier in this chapter). This is usually because, unlike the extravert who gains energy from the work with others, the introvert finds that the process of communication with others drains their energy. As a consequence, they will only make connections with others when really necessary, and not as a fundamental part of their learning as would be the case for an extravert.

> Then the forum's good – like people putting information up and questions. Often it's the question you think "I won't ask that. That's too dumb". But somebody else already has so [you] go "Ok, I know how to do that now". Yeah, and I mean you can always email everybody and they'll respond. (Samantha)

> I feel that if I really had to or if I wanted to I could get onto the forum and I could ask questions or I could contact the lecturer and things like that, so I don't feel alone. (William)

> I don't necessarily depend on other people to extend my learning, although I do tap into that when I need to. I'll seek out other people when I need to, but I don't depend on that to extend myself. I'll go off – I'm quite happy to go off in a corner with a thick, thick book and have a good read and wade through that. (Catherine)

Here we see these introverted learners are quite willing to make connection with others when needed, but there is a sense that this is not a necessary part of their learning environment, and will only be added when needed. This is in contrast to extraverts, for whom the connection with others forms an integral part of their learning environment. As introverts, they will be much more likely to add resources they can use by themselves, as can be seen in Catherine's comment *"I'm quite happy to go off in a corner with a thick, thick book …"*, rather than include others.

As a consequence these introverted learners are less likely to enjoy those environments that require immediate communication, particularly if those they are communicating with are not well known, as often happens in online synchronous chat.

> I went to the chat room once. And it was just chaotic. And I struggled to keep up with the conversation because like there were points flying everywhere. So it sort of went a bit fast for me. Yeah. So that was a bit hard. I found like that some people were talking and I didn't understand what they were going on about so, and I knew that I had to post something because we were being assessed on our contribution so, if you get what I mean, so I prefer sitting in a group and listening to everybody else discuss, because I don't have to actively participate but I found in the chat room I had to get out there and that was a bit hard for me. Does that make sense? To put yourself forward like that. (Janet)

> I'm not really a chat room type of person. (Harriet)

> I don't like the idea of having to sit there for an hour and a half in a[n online synchronous] chat room and do it then and there. … Yeah, you've got a group of other people, they're usually stuffy and you just don't feel like putting all your energy into it. You just want to go home. (Donald)

Despite Janet's comment that she preferred face-to-face discussion she indicated that this was because she could "opt out" and be a passive observer, which was not possible in the synchronous chat environment as assessment requirements forced her to participate. When put in a position that requires this connection with others that is not of their choosing, they may find the situation quite draining, as is illustrated in Donald's comment *"you just don't feel like putting all your energy into it"*. As a consequence they will often prefer to use online asynchronous communication facilities in preference to face-to-face or online synchronous communication.

> Sometimes I'll ask him [face-to-face] and I'll get him to write it down, just key points and things like that so it might sort of help me. Mainly email though, because I can always go back and read it, or something written down so I can look at it later, because if I don't understand something maybe two weeks ago, or if I did understand something two weeks ago and now all of a sudden I don't again, I can't remember what he said, but I can go and I can read the notes or the points or something that he wrote down for me, and like, help me again. … I'll be more likely to send him an email to say I don't understand instead of posting it to everyone and saying can anyone help me. I'll go straight to him. (Barbara)

> The email just allowed everyone to collect their own thoughts without feeling that, you know, without everyone, well, you could collect your own thoughts without the, um, what's the word I'm looking for, the input of others at that point in time, which may sort of make you digress off your thoughts or confuse your thoughts. (Derek)

> The best [way of contacting lecturers], and I've tried a couple of times over the years - probably last year sometime it would be – email I found

> was the best contact. Once I tried phone but it was just awkward. Email was best. (William)
>
> I prefer to do it [online activities] on a bulletin board [asynchronous online], which I prefer to have been given some sort of thing to go home and think about it and then formulate something at home then just post it. (Donald)
>
> The forums, they're fun, because I've said before it's anonymous, and you can sort of say what you like without really owning it, you know. (Patrick)

Here we see that email provides the communication medium for one-to-one connection, with William also finding another form of synchronous communication (i.e. phone) awkward. Communication in the online asynchronous forum still gives the introvert enough sense of being by oneself, and so avoids this form of communication becoming a de-energizing process. This was the case for Donald. Patrick also keeps this sense of being disconnected from others by seeing the asynchronous forum as "anonymous", even though this was not actually the case, and hence the forum use becomes "fun". This is supported by Russell's (2002) research, which found that introverts showed a preference for the asynchronous online environment, identifying it as a "comfortable space in which to express their personal opinion as they built rapport with their colleagues" (p. 33). Ellsworth (1995) also had similar findings, indicating that "some fairly introverted students (as assessed by the Myers Briggs personality inventory [sic]: Myers, 1984) found that interactions with peers and professors were facilitated using CMC" (p. 35), becoming more vocal in this environment when compared with the face-to-face environment.

When face-to-face work is required, they much prefer working in small groups, where they can connect personally with individuals.

> I liked it when we were able to get into small groups and discuss things and work together on the tasks that we were given. … I think also because the class is so, often a lot bigger. People don't feel comfortable talking to each other because there's so many, much [sic] more people and, you know, someone else might speak up, and [you] end up being quiet and no-one wants to say anything. Whereas if it's a small group then we can talk a lot more and understand what people are saying. (Jocelyn)

> … because we have been one big group, I don't say much in that session because I'm intimidated by the big group setting. But if I had a lecture then a smaller group – well we did break up into smaller groups at one time - I was probably one of the main leaders of the smaller group, but when it comes time to, with the sixty people sitting round that big circle, I won't say a word for the whole time. (Donald)

> In a typical week so far I go to the lecture; listen to what they have to say. I'm not a big contributor in discussions and that so I don't work well in big groups, so usually after the lecture then I go away with my friends and discuss what was talked about in the lecture - so, in a smaller group. (Janet)

When faced with a large group they will withdraw into themselves and contribute minimally, if at all, much preferring the small group setting where their contribution will be greater, and in which they may even develop a leadership role, as in Donald's case.

In summary, introverts are likely to be more independent learners than extraverts, working alone to understand material and solve problems. While they will communicate with others, it is not essential to their learning process, and they are more likely to add resources such as reference material to their learning environment rather than people networks. They will prefer the asynchronous over the synchronous online communication environment, and, when face-to-face communication is required, they

prefer small group communication, frequently becoming passive observers in large group settings.

6.2 Perceiving of information – Intuition (N)/Sensing (S)

This dimension is about how people take in information and become aware of things. During the perception process, when this dimension is active, the complementary dimension, that of coming to conclusions about what has been perceived (the Judging dimension), is suspended (Myers & Myers, 1995). Within the Myers-Briggs perceiving dimension, there are two ways of perceiving information: that of intuitive perception and that of sensing perception.

6.2.1 Intuitive perception

Learners with intuitive perception will focus on ideas and possibilities. They perceive information using a conceptual framework, looking for insights and abstract representations, and will have a more overarching approach to their learning (Myers & Myers, 1995). This can be seen in the way intuitive perceivers describe the aims and objectives of the unit.

> It [the Psychopathology unit] gives me an insight into how the human mind works. (Patrick)

> I think the aims and objectives of the unit is [sic] to make students recognize how we utilize technology. (Angela)

These comments show the emphasis on the broad aspects of the disciplinary areas, focusing on the concepts underlying the discipline (i.e. "the working of the human mind" and "the utilization of technology"). They will also focus on the theoretical aspects of unit content, looking for linkages in the specifics that relate to the theory, as shown in the following comments.

> Really you could look at anyone and there were new theorists that I hadn't looked at before. … we were given examples of this child and what he was doing and we could actually link in a theory. (Astrid)

> I've got layers of theories going back to my first degree. Like, I've got connections in a sort of big mind map in there. … I try to link it [the topics of the unit] with other things and other ideas about, you know, about Science, about Philosophy. (Patrick)

> Finding out what integrated curriculum is. Being able to use it, apply the knowledge that we gain from the theory into a practical sense. … finding out basically theory from that. (Esther)

These comments show that the way these intuitive learners use information is to connect this specific information from a unit into their overall theoretical framework. The emphasis here is on finding out about the theory that will then support the practical application.

This emphasis on the overarching conceptual framework of the unit encourages the intuitive perceiver to commence with an overview of a topic before going into more depth. They will look for outlines and overviews to assist with this, or build this global view themselves.

> I try to get the big picture and then go to the essay topic. (Mandy)

> Interviewer: Why are you doing the unit [Technology in Education]?
> June: It's compulsory, but yeah, not only that. I guess it's a part of who we are and what we're made up of. It's the big picture that I'm looking at.

> I put a search in and have a look and see if someone's got a very small simplistic overview, then you know and you think, 'Oh, ok. I get that picture now. Now I'll go in more in depth.' (Samantha)

Here we see this emphasis on determining what the "big picture" is before looking for more details. As a consequence, these learners will add resources to their learning

environment that will enable this overview to be gained. A common resource used for this is the textbook of the unit.

> I'd read the text book. I'd get a couple of good references from the textbook, I'd get a couple of references from the references, you know, from those articles – that generally gives you a good overview. (Patrick)

> The textbook sort of gives you that basic overview knowledge. …I'll be preparing an assignment, so I'll read the chapter on it [in the textbook] because that usually gives you a bit of an idea of the theories and where you're going and that, and a bit more informed. (Samantha)

> I'll read the chapter in the text [book] because usually they've got an overview rather than getting down to detail, so I'll read that first and then I'll have a look at the readings. (William)

> I start with the text book if you like [for assignments], straight down to the basic - well the study guide if there's [sic] summaries in that. And then I go to the textbook, which will provide more detail than was in the study guide. The readings then enhance what I've picked up in the textbook, so they give me more specific information. And then if it's a topic for an assignment I'll then do my own research, which then broadens the whole topic. (Veronica)

There is a sense in these comments of developing an approach that begins with the resource that can provide an overview, followed up by ones that can provide more detail. In some cases this is the textbook followed by other references (e.g. readings or articles), while in others it is a chapter heading followed by the detail of a chapter. Another tool often employed by intuitive perceivers is that of using mind maps to build this conceptual framework.

> I like mind mapping and things … like making concept maps and things like that. (Patricia)

> … you'd sort of draw mind maps of things and you'd try and relate it to your existing knowledge. (Patrick)

> [For] the project I've enjoyed doing mind maps…. Mind maps, maybe, and brain storming - brain storm about what I should answer or something. What my ideas are to start off with. (Rachel)

> As a start we sat down together and thought about a topic: came up with an overall question. Then from that question we designed a mind map. We had different categories coming off, and then, so we split it into four so we each had a section to research individually. But then we decided to come up with a rationale for our project as a group, and then we went through and did a rationale for each section. (Kirstie)

> … pull out the Curriculum Standards Framework information while I've got the question clear in my head and then I start making probably just little dot points and then from the dot points I'll do like a mind mapping thing. (Joan)

This mapping mechanism facilitates the breakdown of a topic or task conceptually, starting with the initial broad topic or question and breaking it down into its constituent parts, gradually adding more detail. It is particularly relevant when studying for exams or completing assignment work, as it enables the learner with intuitive perception to gain a sense of the linkages between the constituent parts, while not losing sight of the overall picture. They will also explore resources beyond those provided by the unit that can extend their development of the linkages, not only within the unit, but to the outer world.

> I'm the sort of person who actually prefers written materials outside class so I get a broader view and a better understanding of the subject, so I've actually gone out and I bought a really old Indonesian dictionary, and I bought a Lonely Planet guide. It's a Lonely Planet kind of phrase book,

> rather. And it's fantastic. It's really small but it's got so much about the language. It gave me a really good foundation of the language itself as well as talked about the culture. (Yolande)

> I do try and keep my eyes and ears open for what's happening at the moment to match that to my readings and that sort of thing. … I watch out for connections and I do go to the library and sift through a lot of books and journals to see if I can find matching things to cross [reference] with there. … I mainly just use it [the Internet] for researching and looking for ideas and different things. (Mandy)

Yolande and Mandy have both looked for printed resources that link the real world with their learning in their unit. In Yolande's case, the Lonely Planet Guide provides the linkage of the everyday use of the Indonesian language and culture of the traveler with her own study of Indonesian, while Mandy is using her information resources to tie in her learning to the current trends in early childhood education. Others have looked to the real world situation of work for their connections, as shown in the comments below.

> I'll look into the activities, trying to put it into the context of what I'm living with at the moment, if you know what I mean. … I work in road safety and traffic … and people say "why are you doing Psych? What are you doing this for? Shouldn't you be doing Engineering or something like that?" … In the first section [of the manual for road works] is what the driver perceives and that's just so basically important to all the designs but they'll miss it. … So they forget that section. So I find that things I'm learning here … I tend to incorporate that into my thinking when I'm doing road safety and traffic things. (William)

> I find that certain areas, you know you have certain interest areas and especially when you can get theory based units. … I found myself looking for more information on things, you know, doing extra reading besides what is set for you that week because it actually sparks an

> interest and you are trying to link the theory to things you've seen out in schools and stuff like that. (Donald)

William's work environment is not directly connected to his work, but, as an intuitive perceiver he will actively seek out any possible linkages; Donald does the same in a more direct way with his school placements. Unlike the sensing perceiver, whose focus is on gaining information directly through the senses, the intuitive perceiver uses the real world information in a more abstract way, looking for the theoretical linkages. Hence they use a range of different resources that may not be directly associated with the unit, but are part of their learning environment, as an aid to building connections that assist them to understand the content and theory of the unit (i.e. travel guides, work manuals, internet sites and other reading material).

For those with intuitive perception, the focus on theories and the exploration of ideas and possibilities is reflected in the communication elements and mechanisms they add to their learning environments to engage in discussion.

> I did go in[to the asynchronous forum] and read, you know, quite a few things that everybody had written to get ideas. (Mandy)

> They're putting their ideas and what theories they think [on the asynchronous discussion forum], which is coming off the lecture notes and stuff like that. (Brett)

> … people [on the asynchronous forum] will give you a reference, and idea. Some new angle on it, you know. (Patrick)

Once again, we see the focus on ideas and theories. For these three learners, the asynchronous online discussion environment provided a vehicle that enabled them to see the range of possibilities presented by others, a necessary way of engaging with information for the learner with intuitive perception. These learners will participate in

the discussion when they see the need to share their own ideas and explore the information further, as shown in the following comments.

> I have [used the asynchronous online forum], yeah. Not very much but I've certainly checked it to see what is there and I think I've asked a couple of questions, but you know, not heaps. (Harriet)

> I would post a few other times [on the online asynchronous discussion] whenever I felt, you know, there was something interesting or, you know, someone was on the right track or one might have found a bit of information that linked with what someone was saying, so you'd tell them about where you'd found a bit more information about that area. (Astrid)

> I don't tend to ask about when the essay's due or something. I like to put something, kind of a bit, um, little message or a little point of view that's a little bit controversial and just try and stir the pot a little bit. (Patrick)

Their sharing of information is typical of the intuitive perceiver. Unlike those with sensing perception, the use of the asynchronous discussion is not to gather facts and share knowledge, but to explore ideas and theories through questioning, as in Harriet's case; sharing linkages, as in Astrid's case; and exploring alternative views, as in Patrick's case. Email was also used as an alternative, as is shown in Astrid's comment below.

> Email was the preferred way [for the group project work]. And that was good too, because sometimes, if we put together some ideas, we could email the whole group as well. (Astrid)

Her group was unable to meet face-to-face and so email became a viable alternative for sharing ideas. As we see in the comments above, the asynchronous online forum was used primarily to share ideas, theories and information that linked to the discussion, with email used when immediate opportunities for exploration of ideas were not available.

There is a difference, however, in the preferred medium for sharing and exploring ideas, depending on whether the intuitive function is extraverted or introverted, and whether it is dominant or secondary. For example, those learners who have extraverted intuition as either their dominant (EN_P) or secondary function (IN_P) prefer the face-to-face communication environment to facilitate their learning.

> [I like to] do a little bit of discussion with students, you know. Especially, I've got a group of mature age students that we meet up and have coffee and what have you. So, um, we talk about what's going on and support each other in that respect. (Mandy)

> I don't very often email. I'd rather come in face-to-face. … Talk to other students. What are they doing, what are they using? … discussing the unit. … Any good ideas? Any new information they've found? (Joan)

> Also I'll chat with other students about a particular topic and get ideas from them and share my ideas with them. (June)

Mandy, Joan and June all have extraverted intuition as their dominant function. As they are all extraverts, not surprisingly, they gain their energy from being able to discuss their ideas directly with others in the face-to-face environment, rather than in an indirect way in the online asynchronous environment. What may seem surprising is that Harriet and Astrid, despite being introverts, also showed a marked preference for the face-to-face environment as shown in these comments below.

> Actually interestingly my workplace is not psychology related as such but there's [sic] actually people there that sometimes will actually discuss the concepts quite a bit. (Harriet)

> I really like the face-to-face learning as well, and working in a group. I really need to, you know, talk to people in person too, and bounce ideas off them, and I think that's really an important part of learning. (Astrid)

This occurs because Harriet and Astrid, while being introverts, have extraverted intuition as their secondary function. This means that they are also energized from being with people when the focus is on the discussion of ideas and concepts, as they are using their extraverted intuitive perception at this time.

The online synchronous environment may provide a similar, albeit different, level of immediate connection that the extraverted intuitive needs, and so may also be used as an acceptable alternative when face-to-face discussion is not available.

> I felt I learnt a lot through online chatting and just reading what everyone else has researched and that was fantastic because everyone thinks different to me and has very different things that you haven't read and I thought "Oh, I haven't thought of looking at that" or "Oh, I didn't think of it that way" and so I found that really helpful for me. (Astrid)

Here we see Astrid indicating that the online synchronous chat was a useful mechanism for exploration of different possibilities, with the real time nature of the synchronous environment enabling her to gain the needed energy from the connection.

The situation is somewhat different for those whose intuitive perception is introverted, either dominant (IN_J) or secondary (EN_J). When the intuitive perception is introverted the learner will prefer to explore ideas and possibilities internally on their own.

> I put the initial one [post on the asynchronous forum] and then I went back and did a little bit more because I, yeah, I could, I had more time to think about that last time. … I prefer to do it on a bulletin board [rather than the synchronous chat], which I prefer to have been given some sort

> of thing to go home and think about it and then formulate something at home then just post it. (Donald)

Here we see Donald, a dominant introverted intuitive, wanting to think things through on his own and then respond to others. Often what they post will be their conclusions, and so they will have shifted into their extraverted decision-making function when posting on the asynchronous online forum. This approach is illustrated in Patrick's comment below.

> I like to raise on the [asynchronous] forum, I like to raise issues that I think are controversial and will cause discussion of the unit. … I like to put something, kind of a bit, um, little message or a little point of view that's a bit controversial and just try and stir the pot a little bit. And then I get a few responses, some of them negative, some of them positive. (Patrick)

Patrick, also a dominant introverted intuitive, used the online asynchronous discussion to put his point of view (i.e. his extraverted decision-making function), which then generates discussion that he can take away and process internally.

When the introverted intuitive perception is secondary (i.e. EN_J), the person will be an extravert and so will appreciate the opportunity to read what others say in an interactive environment.

> … for this particular subject, I'd always go to the [synchronous] chat room first, and then I'd do my reading … you'd go in the chat room, get your ideas, go to the readings, do your readings or whatever you have to do. (Patricia)

Patricia's comment shown above illustrates this. As an extravert she gains her energy from interacting with the outside world, hence the synchronous environment satisfies

this, but because her perception is introverted, she uses the chat room to gain ideas from others rather than contributing herself.

Alternatively, those with introverted intuition will explore the ideas on their own, as in Kirstie's case as shown below.

> And then if I don't understand something I'll go away and research it myself, individually at the library. (Kirstie)

Here we see that the gathering of information is introverted and done alone. The need to do this as a private activity may be related to the clarity of her extraversion being very clear, which may cause any attempt to gather information and explore it in an extraverted environment to be subverted by her extraversion. Patricia's extraversion, by contrast, is only of moderate clarity, so she may be able to remain in her introverted intuitive mode more easily when in the extraverted environment, finding that the nature of the online synchronous environment still provides some element of detachment, even though it is essentially an environment that facilitates extraversion.

In summary, those with intuitive perception will take a global theoretical approach to their learning, using resources such as study guides and text books to provide an overview, often using mind maps to develop a conceptual framework of the material to be studied. They will look for resources that can provide linkages, not only within the unit, but to the broader theoretical setting beyond the unit boundaries. Communication is used to explore possibilities and share ideas, with a preference for face-to-face communication when their intuitive perception is extraverted, and asynchronous communication for those whose intuitive perception is introverted.

6.2.2 Sensing perception

In contrast to intuitive perception, the other type of perception is that of sensing perception. Learners with this type of perception rely on the gathering of information directly through the senses. They focus on facts and details within the concrete world, more concerned with the actualities around them than on conceptual, abstract and

symbolic representations (Myers & Myers, 1995). This focus on detail can be seen when these learners describe the aims and objectives of a unit as in the following comments.

> The aim of it [the Psychopathology unit] is to inform us about the huge variety and the treatments of all these problems. (Ben)

> The aim of the subject is to get as much knowledge as we can. (Barbara)

Here we see the aims and objectives expressed in terms of accruing knowledge or the specifics of the subject area, with no mention of either the broader aspects of the unit, or the conceptual framework. Ben's focus is on the details of the specific problems and associated treatments encountered in Psychopathology rather than this being one aspect of the working of the human brain, and Barbara's focus is on the accruing of specific knowledge and learning the detail. When sensing perceivers do mention the theory of the unit, it is secondary to the practical application.

> Um, the aims and objectives [of the Childhood Development Unit] were to, well basically to be able to use theoretical underpinnings to help solve a particular um, development issue, or issues, for a particular child. So to be able to recognize when there's [sic] behavioural issues with a child, how to recognize what's causing those issues, and be able to, um, based on, you know, theoretical understanding, be able to come up with a strategy to address and help the child work through those issues. (Derek)

Here we see Derek commenting on using the theory to support the practical application. As someone with sensing perception, his emphasis is on that specific application, rather than an emphasis on finding out about the theory, as would be the case for an intuitive perceiver. The approach to learning for a sensing perceiver is to focus on the details first, looking for a wealth of detailed knowledge and then using that detail to learn about the unit.

> I bombard myself with information first and I don't write a thing. So like I said, I might download fifteen articles off the Net and read the relevant [parts]. I might have five or six textbooks lying around home which are current which will have something on the topic. I'll photocopy them too. … Then I'll go through and highlight the bits that are particularly relevant. And the bits that I found I don't need – I tear them up. (Ben)

> I'll get a heap of information. … I go straight to the computer and I'll start writing um, dot points, important points on the computer. And then I'll start to work on those points and develop them into an essay. (Tanya)

> I don't draw [concept] maps. I use lots of pieces of paper. I'm one for putting things on pieces of paper and then I can organize it all. I'm starting now to do it on the computer so I can have lots of little Word windows open and then I jiggle them around and change them like that. (Claudia)

As can be seen from the comments above, these learners do not start with an overall view that the pieces then fit into, but rather with a lot of separate bits of information that the learner is trying to fit together, which will eventually show a complete picture. It is somewhat like being given jigsaw puzzle pieces without the final picture. The process is to fit them together, enabling the final picture to emerge at the end.

In contrast to the intuitives who work from an overview and look for linkages across areas, sensing perceivers will split the work into smaller, more manageable areas and focus on the detail of that smaller area.

> One of them was an oral assignment where we just had to write about, we had to actually talk about ourselves in Indonesian, so with that I went through each week and found out what topics each week [we] had been covering and what I can say about myself regarding these topics. (Jocelyn)

> There are ten tasks per week, so I try and complete a task a night, which sounds ridiculous because there's only seven nights in a week, but some of them [the tasks] are very much, read this as one task and the next task will be answer these questions, so that in my mind becomes one task, because I can't answer the questions until I've read it [the set piece of reading]. (Julia)

Here we see both Jocelyn and Julia breaking the problem down into smaller tasks. Jocelyn has focused on the topic areas, while Julia has focused on the tasks. Sometimes there is no clear division used, but rather a focus on each small piece of detail, as shown below.

> I have to break it all down and think 'right, this is the area I've got to focus on first, and then this and then this' and then I'll just gradually build up. … if there's a word on the CD that I don't understand and things, I'll look it up in the dictionary. If I can't find it then I'll use another dictionary, and if I'm having real problems on it then I might go use the online dictionary. (Barbara)

> One of my very first exercises [for working out the Indonesian text] is I actually highlight words that I don't know so in reading the conversation that he has set for the given week. My first task is to highlight words that I don't know and then I get carried away usually with underlining the ones that I do. (Julia)

> If I'm struggling with something it'll just be a very narrow straight down [the line], let's just get these facts in the head and worry about getting it over and done with. (Tanya)

Both Barbara and Julia, as sensing perceivers, focus on the actual words and their meanings in their study of Indonesian. This is quite different when compared with an intuitive perceiver, who would be likely to try and determine the meaning of the overall

sentence first and the specific words later. Tanya's sensing perception also leads her to focus on getting *"the facts in the head"* as she puts it. The focus then, for these learners is to search for detailed information. As a consequence they use resources that provide large amounts of information.

> At the moment I would say Internet based or technology based for gathering information. (Anne)

> I hop on the Internet and go to Ovid and all the, ProQuest, all the ones we get given; the resource Internet sites, and get as many studies as I can that are going to relate to my subject then I usually read them and come back in a week's time and read, or highlight as I've read, you know, certain things I thought I might use. And I usually come back after a week, read them again, start writing what each sort of study found and then go on from there. Usually it takes probably I leave three weeks. I may not work on it every day but I have that time to let it sink in and to reflect on it; come back to it and then usually I've got more of an idea. If I try and do it all at once it doesn't work. I can't get my thoughts in order. … I always try and get all the facts out there. (Elizabeth)

> I start in the very beginning collecting bits of information; going over it. And I need to think it through and question it. Sometimes I'll write screeds of notes and just, yeah, I really need to think about things. … I need to see how it fits in and whether its relevant or not, so I'll collect quite a variety of information and then I start going through it. (Claudia)

Once this information has been collected there is a need to have time to process it. This is particularly the case for those learners whose sensing perception is introverted, as can be seen in these comments from Elizabeth and Claudia. They are aware that, because they approach their learning starting with the detail, they need to allow the concepts and theories that relate to the information to emerge over time through a process of internal reflection.

For those with sensing perception, communication becomes another resource for sharing and collecting facts, knowledge and information, rather than a vehicle for discussion of ideas and concepts, as would be the case for intuitive perceivers.

> Like the more knowledge that gets shared the more you learn. So, yeah, I think it'd be a good idea [online synchronous communication] but I guess the [asynchronous] forum's the closest thing to it because it's, I mean it's pretty instant as far as within a day or so you are being answered. (Elizabeth)

> I've got a few friends who are teachers, so I've guess I've been picking their brains for ideas as to what works and what doesn't work and what would be appropriate and age appropriate and content appropriate. We've also gone back over what we've done in the classroom in our placements, because we've all been in a classroom collectively that's spanned from p – 10. So within that we've had a good look at different learning styles from the students and different teaching styles from the teachers. So we've been using that information plus obviously the stuff that we've gotten from the lecturer and gone off and done lots of other bits and pieces. (Claudia)

These learners refer to sharing knowledge as in Elizabeth's case, and the collecting of ideas and information as in Claudia's case. It should be noted that the reference to ideas is about collecting these as information rather than a discussion of them as concepts, as would be the case for an intuitive perceiver.

Because those with sensing perception focus on the gathering of information through their senses, there is often a need for a physical form of communication to read the nuances of that communication.

> So much is lost in the translation when you try and write something. Most communication for me happens in face-to-face because that is the body language and the interpretation. It's not the words that are used.

> Although you can get a message across in email all you are doing is getting the message across, not necessarily communicating fully. (Harold)

> Interviewer: How connected do you feel to the other students are the teacher, both online and offline?
> Harold: Online not at all. Offline, face-to-face quite well. … Online I'm totally and utterly divorced from it.
> Interviewer: So it's like talking to the computer?
> Harold: Oh, yeah.

> To me the conversation is more important than typing into a computer. It's the relationship. The relationship that you create … you pick up visual cues and puzzled looks and that's how I operate in the classroom. … Whereas in a chat room they can have the idea that they might be on the right track but you can't pick up exactly when they've missed that link. … For me the relationship is more important than the tool, and that's the way I regard computers. It's a tool, not a means of establishing a relationship. (Catherine)

As can be seen by these comments, their sensing perception causes the physical presence of the computer to get in the way of the communication. They feel like they are talking to the computer rather than talking to a person, or transmitting just words rather than having a meaningful conversation.

Some also need to do physical things to aid their learning, and look for practical activities to add to their learning environment that will assist with this.

> I can't just read or listen. I've got to, if for example, I've got to read like a reading or something, I've got to take notes at the same time so if I see an important point I can't just highlight it or something. I've got to rewrite it out. … I'm much better visual and practical and actually doing something. (Janet – ISFP – extraverted sensing – secondary function)

> Interviewer: What sort of activities do you prefer most?
> Claudia: Actually physically doing things. Yeah. Getting in there and doing things. Once you've done it, it stays in your mind longer. I like to see it and read about it and do it, and do it a couple of times. Get proficient at it, and then hopefully if I need to do it in another six months I can remember.

> Well we do a lot of role-plays and things like that. … One day he [the tutor] brought in a big box of clothing and we played dress-ups. … It was funny at the time because people got ridiculous clothing on, but it made me remember what it was, … because it was just a break from just sitting and just writing and just listening and taking notes … It's almost like giving your brain a bit of a break. (Barbara)

It is interesting that these activities can be as simple as writing something out, as in Janet's case, or something far more active such as the engagement in role-plays, as in Barbara's case.

Practical applications and practical outcomes are also important to the sensing perceiver, as they use their senses to make sense of the information they are processing. They will often show a preference for these practical activities, as shown in the comments below.

> I need that practical stuff. (Julia)

> I like practical applications, and I think if I can see a practical application I'm likely to be more engaged. (Catherine)

> I like to collect resources that I think might be valuable when I graduate and become a classroom teacher. So anything that I think might be able to use in a class as a teaching activity or as a venue for knowledge. (Catherine)

These comments indicate this need for information that can be applied or shown in some concrete way. Julia has referred in general terms to something practical, but Catherine has gone one step further and not only adds practical applications to her own learning environment to aid her understanding, but also adds practical resources that she may be able to use later in her teaching career – resources that can be added to her own students' learning environments.

When asked for more specific details, the sensing perceiver will outline activities that are very concrete in nature, as in the following comments.

> I quite enjoy the workshops we have in the unit. Sitting down and learning new computer programs, provided I can see that they've got a point. (Harold)

> One teacher in particular had the way that he taught the unit; just really made it easy for me to understand. … he basically used the entire time [at the residential school] to get people out on the stage and do examples. (Tanya)

> We're creating – we've got to have a major issue and a big question, and our question is about globalization and how it affects me as a person - and our end product is a market stall that groups of students will put together. It's actually in a shoebox, so they create like a virtual market stall with the possibility of them taking it on to being an actual stall if they wanted it. (Anne)

As can be seen in these comments from Harold, Tanya and Anne, the practical hands-on nature of the tasks, such as learning computer programs through workshops, acting out examples in a physical space and creating projects by developing a physical model, are all preferred ways of connecting with the information, as they utilize the examination of this information through the senses. Anne's comment is particularly interesting. Despite referring to the creation of a *"virtual market stall"*, the actual outcome is a physical model

of the reality in miniature, rather than a true virtual representation. This shows the need for the sensing perceiver to have something real and concrete to work with in their learning environment to make sense of the conceptual understandings required for tertiary level study.

This reality is similarly reflected in Derek's comments below regarding the problem-based learning scenario used in the childhood development unit.

> The actual tutorials I found fascinating because uh, it was all based around this one child who had these difficulties and your stakeholder role and how you were going to approach it, and so it was like we were in a staff meeting at school and we were discussing a particular child and we had to, it was a real child, so we had to come up with some strategies and something that would be really effective and help that child. (Derek)

> I've got three children of my own and we've been having some developmental problems with one of those children. … there was this real, real added addition to what we were studying and so, I didn't purposely add it, but it was there to do comparisons and everything with. (Derek)

He shows here that his sensing perception has enabled him to translate the constructed scenario, not only onto a real child, but the discussion of the child's problems into a real life situation of the staff room meeting. He is also able to relate this to the very real situation with his own children, using the concrete reality of his sensing perception.

In summary, those with sensing perception will focus on facts and details and use a bottom-up approach to their learning. They will add those resources to their environment that can supply this information, and will engage in activities that have a practical application. They will use communication to share and collect knowledge and information. They will often prefer a form of communication that allows them to read

nuances collected through the senses, whether aural or visual, and may find that the text-based technological forms of communication can impede this. They will also add concrete examples to their learning environment to aid their comprehension of concepts and theories.

6.3 Decision-making – Thinking (T)/Feeling (F)

This dimension is about coming to conclusions about the information gathered during the perceiving stage. During the decision-making process, when this dimension is active, the complementary process – that of gathering of information – is suspended (Myers & Myers, 1995).

6.3.1 Thinking judgment

Those with T type preference will make decisions based on objective logic. They will look for consistency, weighing up facts and ideas in an impersonal, objective way and examining the pros and cons of the situation objectively (Myers, 1998).

> There's a responsibility there to help, you know, well, to give that sort of feedback, to help the lecturers make the right, you know, make decisions in future in terms of the direction that the course, the unit, should go. (Derek)

This comment of Derek's is typical of a person with thinking judgment, showing that the focus is on the "right" decisions the lecturers need to make, implying an application of logical analysis to determine what might be wrong and then correct it. Tanya also indicates providing feedback in an objective way, as can be seen in this comment.

> We give feedback forms at the end of each unit and I usually try and be quite direct with the feedback because I know how difficult it is to get wishy-washy feedback. … I'm also careful that I don't over criticize the presenters, because I know that's not their full time job. (Tanya)

Here Tanya illustrates her process of critiquing and providing constructive feedback. She judges as "wishy-washy" anything that does not examine the situation in an

objective manner, providing objective information about the specifics of what might need to be improved. She has, however, also used objective reasoning for the expected standard of the teaching, which leads to her decision not to be over critical.

In the construction and use of their learning environments, those with extraverted thinking (i.e. ISTJ, INTJ, ESTJ, ENTJ) will use communication to come to conclusions about the information that is presented in that communication. Sometimes these conclusions are to improve the understanding of the learner, as in Donald's case.

> I use a lot of my communication to make sense of what's going on. To understand what they are expecting and what people are doing. I find that when I vocalize to discuss things, that all makes sense and that's my main concern. I pretty much, I can work by myself a lot, but often need the communication with other people … to make sense of it all. (Donald)

Donald, with his extraverted thinking judgment, has a need to talk things though in order to draw conclusions about the information. In his case, this is linked to his understanding – his making sense of the information he has collected in his introverted intuitive perceiving mode.

At other times the communication is more about discussion to determine the position others hold in relation to the information, as is the case for Claudia.

> When we're meeting together I'm probably 'This is what I've found. This is what I've looked at. What do you think?' … And we'll put it on the table and pull it to bits and see how we work around that … they've [the other students] just got so much that's in and on paper and on Web sites and set and ready to go and it's kind of like mine's still in my head and will come out a bit later on. But I can talk it. (Claudia).

This comment indicates the use of discussion for decision-making; that is where the talking is done to make decisions about the information brought to the table. Claudia's posing of the question *"what do you think?"* indicates this aspect. Because she is an extravert (i.e. ESTJ) there is also a need to interact with others and hear their judgments in order to make her own decisions. For Claudia, because her sensing perception is introverted, her comment *"it's kind of like mine's still in my head"* indicates that she has focused on the accumulation or perception of information internally, and it is only when using her extraverted thinking judgment that the information *"comes out"*.

Those with thinking judgment find that their connection with the lecturer relates more to the objective information and input the lecturer can provide in order to assist the learner, than to the attitude of the lecturer and the relationship they might build up, which is likely to be the case for those with feeling judgment.

> I find [lecturer's name] a really good lecturer in that she has a wealth of knowledge and she expands on her points in a really good way. … she was always expanding and bringing her own personal experiences and giving us stories of how, you know, some of the things she's experienced that were explicitly linked to the point she was making. (Derek)

This comment of Derek's indicates he has made a judgment about the lecturer based on her knowledge and insights that she can provide. There is no mention of his relationship with her, nor do his judgments relate in any way to her level of enthusiasm or attitude. This is in contrast to those with feeling judgment, who focus on their relationship with the lecturer and their feelings about them in order to determine their worth, as is shown in the next section.

In summary, those whose thinking judgment is extraverted will use communication to come to conclusions about their learning, rather than using it to share ideas or gather information. They will look to the lecturer for the objective information he or she is able to provide.

6.3.2 Feeling judgment

By contrast, those with feeling judgment will make decisions based on their own personal value system. They will often comment whether their connection with the unit "feels right". Comments will be expressed in terms of how the learner "felt" rather than what they "thought".

> So a lot of it is reflection so it's um, that part you didn't have to learn particular content. It's how you felt. (Patricia)

> … if you're working in the language outside of the course that you may be able to get some credit towards the residential school, and I just want to see what that looks like, feels like, you know … (Julia)

Here we see learners trying to get a sense of aspects of the unit through connecting with their feelings about that aspect. Sometimes they will project these feelings onto others, assuming that other learners feel the same way about the unit as they do. This is evident in Ben's comment below.

> I've got some fantastic, um, case study examples which I can't wait to inform people about, and I imagine that most other people'd [sic] be feeling the same. (Ben)

Ben has made the assumption that his connection with his topic and what he feels about it (i.e. his subjective judgment of his interest in it) is the same for others. This judgment about a unit indicates a personal connection which then extends to others, demonstrating a focus on relationship that is important to those with F type judgment. In the construction and use of their learning environment, relationship takes on an important role. Therefore building a relationship and personal connection with the lecturer is important, and the teacher's interest will impact on the decisions they make about their study.

> I suppose it helps me a lot because I feel like they're making an effort and they're wanting me to understand them and for me to learn. So I suppose that I feel I can't just go home and look at it and go 'Oh well, stuff it. I don't know'. (Barbara)

> If they're [the lecturers] inspirational, if they're excited by the subject then, you know, I get excited by the subject, and they make you, you know, want to do more. (Mandy)

> There was another subject … the notes in the study guide were very negative, and very, you know, 'you'll be likely to fail this subject', and for a psychology subject it was very interesting that they used that approach. It was very depressing, if anything else, and it just didn't encourage, and I guess from that I've learnt that if I've got an encouraging lecturer, somebody who genuinely wants to see you perform well, so they're on the phone all the time and they're giving you constructive criticism, and they're really trying to help you learn, as opposed to somebody who just doesn't demonstrate any interest like that, I certainly perform better. (Veronica)

Here we see that the lecturer's attitude to the unit, either through their personal enthusiasm for the unit or their motivation of the learner, impacts considerably on the learner's own attitude to their motivation to learn. Even when these learners are studying via distance education, as is the case for Veronica, the perceived attitude and support from the lecturer is important, despite the actual contact with the lecturer being minimal.

Facilitation for these learners is often expressed in terms of the personality and attitude of the lecturer, as can be seen from these comments below.

> Interviewer: How does the facilitation of the teacher impact on your learning in terms of the communication?
> Joan: Well, I think the lecturers are just great.

Interviewer: Does that influence how you set up your learning environment yourself?
Joan: I think so, yeah. I think if you had a lecturer that was very aloof and very distant, and, I don't know, sort of made you feel that you couldn't really do the unit, I suppose, I don't know, I think your whole approach to it would be negative, yeah. The lecturers here, they're very motivating and engaging so you go home with, I go home with interest and excitement and want to get into it and want to get it done.

Interviewer: How does the facilitation of the teacher impact on your learning?
Angela: Well, I am very happy with the teachers throughout the whole course of primary teaching, but in Technology I think our lecturer really injects kind of a very positive approach to it.

Interviewer: How does the communication of the teacher impact on your learning and your learning environment, if at all?
Rachel: Whether they're approachable or not; whether I feel that I can approach them and get help, makes a difference.

When asked about the facilitation role of the lecturer, they respond with a comment about their feelings towards the lecturer and whether they have a sense of a good relationship with the lecturer (e.g. *"I think they're great; I'm happy with them"*). This is in contrast to those with thinking judgment, who focus on the lecturer's competency or knowledge about the unit and the way he/she facilitates the learner's understanding. It is this personal connection that helps to make learning accessible for those with F type judgment, particularly when combined with intuitive perception (i.e. NF). These people are referred to as the "Idealist" temperament and "value empathic, meaningful relationships" (Myers, 1998, p. 31). For those with sensing perception combined with feeling judgment (SF), the physical presence of the lecturer or other students is important.

> Fantastic lecturers - I mean, you never get to meet the lecturers unless you come to a [residential], come here. The other subject, I've only been here twice, two of my subjects required it, and both times it's been a very positive experience, I think, seeing the person. I don't know why it makes a difference. I guess it does because we're people. (Ben)

> I gave up two nights a week for a year [to study on-campus for other units] … and it was just fantastic. And at the end I got Distinctions in both those [units] and just felt so comfortable with the idea of a lecturer being there, you being able to communicate with them, you had the textbook, go away, tutorial groups: to me that's ideal. (Ben)

> There's communication with other students at the campus and that was face-to-face and I used those because it was a good chance to practise our skills in a real life situation and we also got to work together and try and figure out what the tasks were that we had to do without the contact of the lecturer. (Jocelyn)

Both Ben and Jocelyn are studying in distance education mode, and valued the opportunity to build relationships using their preferred mode of perceiving through their senses. This aids in their connection with the unit, and hence their learning.

Building relationships and developing rapport with other students is also important for those with feeling judgment.

> … coming to residentials and meeting students there's certainly a lot of rapport that's developed at residentials and on the [asynchronous online] forum so that you do develop friendships with other students. You know, there's a lot of interaction and a lot of assistance, which has been noted particularly at this residential. Its' been very interesting, this willingness of people to help. (Veronica)

This comment was made in response to a question about responsibility to other students, so there is a sense of that shared commitment to each other in the unit that is built through both face-to-face and online communication.

Having communication mechanisms built into their learning environments is important for those with feeling judgment as it enables them to make sure that others are agreeing with their own sense of decision-making. Because a person with feeling judgment will base their decisions on their own personal value system, which is a subjective mechanism, they will often feel a need to check this against what others have decided. Hence the discussion environment becomes less a mechanism for discussing ideas and sharing information, and more about checking whether they are "on the right track".

> The forum seems to be addressing any questions that I have or, you know, just getting a feel for how everyone else is tracking as well. (Veronica)

> I like to go up and have a look [at the asynchronous discussion forum] to see what other people's responses have been to the CD and compare it to mine and see if I'm sort of on the right track. (Barbara)

> Um, it [communication] helps me to learn. Definitely, um, it expands my ideas because I get to hear what other people feel about things as well. (Kaitlin)

> If there was someone up in my area who was doing a subject, yeah, I would get together. … Because so many times, because I used to do um, my minor through the local uni. And I really liked that, being able to sit down and go "What on earth does this question mean?" over a cup of coffee, and just have a talk because sometimes you're going to go left and everyone else goes "No, no, your question's gone right." And I believe that's great. (Samantha)

Here we see these learners indicating their use of communication, whether it is face-to-face or via an asynchronous online communication, enabling them to check that they are "on the right track" and to assure themselves that their ideas and decisions fit with others. They will also use this communication to gain a feeling of support through the recognition that others are in the same situation as themselves.

> With my fellow students I often find it reassuring, you know, that I'm not the only one that's a bit behind or I'm not the only one who doesn't understand some part of it. (Phillip)

> I have a feeling, particularly in the [asynchronous online] forum, the main form of communication between the students, this would be the forum, and I think there is, I mean, there's a little bit of a support function there in terms of, you know, actually you do get cries for help type of thing. And whilst you might not be actually doing that [yourself], you just realize, all right, other people are struggling. You're not the only one who is struggling. (Harriet)

This personal connection with others in a similar situation is important to those with feeling judgment, and, if this sense of connection is not present, they may disengage with the communication, as shown in Joan's comment below.

> I think if you don't get, have really good conversations and get really good feedback you could find yourself very lost in this unit. … I put up things [on the asynchronous discussion forum] all the time and I think "Oh maybe somebody else might be feeling the same way I am", but nothing ever comes back so then you lose interest in the end. (Joan)

Here we see Joan referring to others *"feeling the same way"* about the aspects of the unit, indicating a loss of interest when others don't respond to her need to build a relationship. This loss of connection may be exacerbated by the asynchronous online environment.

> Interviewer: How connected do you feel to other students and the teacher when you're online?
> Kirstie: Not a great deal actually. As again, going back to face-to-face I'd rather be sitting in a room. In a round table discussion everyone's sitting there voicing their opinions and throwing around ideas rather than sitting at a computer and typing away.

Kirstie was assessed as having an ENFJ personality type so her dominant function of feeling judgment is extraverted, hence the need to discuss with others when coming to conclusions about the content of the unit. As we can see from her comment, the discussion is for voicing opinions, which aligns with her extraverted decision-making, and can be done more easily when in the face-to-face environment.

As already mentioned, the physical connection aids those with feeling judgment combined with sensing perception, and, like their relationship-building with the lecturer, their communication benefits from the reality of the face-to-face environment that allows perception through the senses.

> Interviewer: What forms of communication do you use?
> Janet: Ok. Well I've already made use of WebCT talking, posting messages to different people in the unit over WebCT.
> Interviewer: So to the bulletin board?
> Janet: Yeah. Um, mostly just talking face-to-face with people: that's how I do most of my communication. … I prefer to be in a group you know, because you can't get a good discussion going, I don't believe, online. I think it's better to be in a group where you can see each other's faces and you can clearly communicate.

> Interviewer: How do you view the online environment?
> Barbara: I like it, but then again I dislike it. I like it because I can, as I said, I can post up a message and I can go back and read it any time and anyone can add their suggestions to it, but I don't like it because I

> don't like that [lack of] personal face-to-face sort of feeling. It's very sort of, um, I feel like I'm even more disconnected from the rest of the group and disconnected from the rest of the people at other campuses and things like that.

For these two learners, their personality types have the SF combination, one which places emphasis on the physical realities of the world combined with a personal value system. As Isabel Briggs Myers indicates the ISFJ personality type (as in Barbara's case) "remember clearly the details of things that have personal meaning for them, such as tones of voice and facial expressions" (Myers, 1998, p. 12) and the ISFP personality type (as in Janet's case) are "acutely aware of the specifics and realities of the present – the people and the world around them " (Myers, 1998, p. 23). When the face-to-face connection is not available the synchronous online environment can serve the same purpose.

> Interviewer: What purpose does it [communication] serve for you?
> Elizabeth: It eases a lot of stress sometimes as far as when I'm starting to get myself worked up because something's stressing me out and I like to have that instant, that provides sort of as much instant sort of contact [through MSN messenger] that I can have with other people. It may not be the lecturer but other students that might be able to either say "I'm feeling the same" and then you kind of automatically go "Well, I'm not, you know, I'm not that bad" … You start off by saying "Oh my God, I can't do this", and then they just say "Yeah, neither can I" and then we kind of move on to kind of helping one another.

Elizabeth was also assessed as having a personality type with the SF combination (in this case ESFJ), and the instant communication through MSN messenger, which she has added to her learning environment, provides this contact for the distance education student and gives her the much needed reassurance required.

Sometimes, when the pedagogy directs a need for deciding how to approach a topic, as is the case for problem-based learning scenarios, those with extraverted F type decision-making will use that discussion environment first before doing other work on the topic. This can be seen in Patricia's comments below.

> For this particular subject, I'd always go to the chat room first, and then I'd do my reading … What you're talking about would be linked to the readings, so you'd go in the chat room, get your ideas, go to the readings, do your readings or whatever you have to [do]. (Patricia)

Unlike those with thinking judgment, who would make an objective assessment of the content to come to conclusions about the topic, Patricia's feeling judgment relies on her own subjective assessment, and so she needs to determine what her feelings are about the topic by comparing her ideas with others. This connection with others as part of her learning environment enables her to come to conclusions about the topic before completing the associated work for that topic.

This connection with others in order to make decisions is not just restricted to the communication and discussion environment. It will encompass any arena where decisions need to be made, such as assignment work, as can be seen in the comments below.

> Get my material and then get my outline done and then possibly do most of it and then connect with someone I know that will read my work and then I'll read their work and just make sure that it's all on track and everything's going the way it's supposed to be going and I haven't misread or misinterpreted what was required. (Joan)

> So I'll type up a first draft [of an assignment] and I'll sort of play around with it for a little while. Then I pass it onto some friends who will understand the topic, so they can proof read it for me and give me some suggestions. (Veronica)

Once again the reference to being "on track" and the reliance on others is shown in these comments. Those with F type judgment seem to require this checking of their decisions, perhaps because they are based on subjective criteria and hence have less of a "right/wrong" aspect to them than do decisions based on objective criteria, as would be the case for those with thinking judgment.

When adding further resources to their learning environment, the decision to determine whether the resource is good and is working is impacted more by whether it feels right than by whether it aids understanding.

> I found that good [the "Gum Nuts to Button" activity] because we were seeing it from the student's perspective; … if we were wanting to use that in the classroom, we would know how the students felt. (Esther)
>
> Interviewer: What type of activity do you prefer most and why?
> Joan: Hands on. Doing. Yeah. Why? I can make better connections with it. If I'm actually doing it and seeing it and it's working, it feels better for me. And I think "Well, I can take it and do that."
>
> So for Indonesian my first thought about learning Indonesian was "Oh, hey, I'll watch 'The Year of Living Dangerously'", because being based in Indonesia I'll get the feeling of it. (Yolande)

Esther found the activity worked well because it enabled her to sense how the students would "feel" about the activity, rather than what the students might actually learn. Similarly, the type of activity described by Joan worked well for her because it "felt right", rather than because of objective criteria that might apply to it such as demonstrating the concepts well or aiding her understanding. Yolande's inclusion of the film helped her develop the "feeling" about Indonesia that was necessary to her understanding.

In summary, those with feeling judgment will focus on relationship and need to build into their learning environments these relationships with others (i.e. teachers and peers) in order to make decisions about their learning. In the tertiary education setting, they look to the lecturer for a personal connection, and use communication for support and to check that their conclusions fit with others. Resources are added to their environment, more on the basis of whether it feels right to them than whether it can aid their understanding.

6.4 Orientation shown to the outer world – Judging (J)/ Perceiving (P)

The judging/perceiving dichotomy determines how a person interacts with the world. This can be through their perception (i.e. Perceiving P) or through their decision-making (i.e. Judging J). For perceiving or P types, the S/N dimension will be shown to the outer world, while for J types the T/F dimension will be shown. As this is the orientation shown to the outer world, extraverts will show their dominant or primary function, while introverts will show their secondary or supporting function (Myers & Myers, 1995 ch. 1). For example, looking at the personality type ESFJ, a person assessed as this type would show their dominant function of feeling judgment to the outer world, as the J indicates the judging dimension is shown to the outer world, with the E indicating that that what is shown to that outer world is the person's dominant function. A person assessed with the personality type of ISTJ would also show their feeling judgment to the outer world as indicated by the J, but in this case their assessment as an introvert (I) means this feeling judgment is their secondary function, with their dominant function of sensing perception being introverted.

6.4.1 Judging preference

Myers and Myers (1995) indicate a number of "gifts of judgment" that support those with J type preference. These are listed in order of importance to the J type, and include the construction of a system for doing things which can be followed consistently; a sense of orderliness to their world, classifying things and keeping them in order; up-front planning which can be quite long-range; persistence and sustained effort in accomplishing things; a need to have outcomes decided; a requirement to see others

conform to their standards; the formation of opinion on everything they engage with that they consider worthwhile; and the acceptance of routine, which is more marked in those with sensing perception (pp. 70 - 71).

Those with J preference tend to be organized and will have their own systematic structure and approach.

> If there's a schedule that I can measure my progress then I'm comfortable with that (Veronica)
>
> The structure's good for me. (Patricia)
>
> The course outline, I always read that. As soon as that arrives I spend time reading that and just looking at dates and looking at an overview of what the topics are going to be. I find that a great way to study. Just to know what's coming up. (Ben)

We can see from these comments that these learners are looking for a structure provided by the unit. This is consistent with Russell's (2002) findings that

> students with a Judging orientation wanted structure in the organization of the module that was presented as a printed study guide with print readings and online sites linked from the module home page (p. 36).

If the unit is well organized and a structure is provided, they will begin with this and will incorporate it into their own learning environment to provide the necessary structure. This is particularly the case for those with a J preference who are extraverts (i.e. E__J).

> Amazingly organized [the unit]. When we look at all the student's study guides and the actual course material and the DC's and all the rest of it – amazingly organized. Very, very clear to follow. … What I like about its

> setting out is that it takes you through your semester's journey. So it begins very much with, you know, the very first things that you need to do. So you need to check that you've received everything that your little leaflet tells you that you should have received. The lecturer also puts in a week-by-week thing, so by the end of week one you should have done this task, that task and something or other else. And that's done by the week. (Julia)

> We've got the outline and clearly marked what you have to do. They've discussed it with us but it's clearly set out. Both assignments are there for us from the very beginning so you know what you have to do. So yeah, a lot of structure. (Patricia)

As can be seen from these comments, both Julia and Patricia have utilized the provided structure to complete their work and plan their time. Julia also has sensing perception as well, and those who also have sensing perception coupled with J type preference will make use of the structure that is provided.

> Well, generally in the order that's given makes sense to me the most. So try and go through the work together in the order that it's written out. (Jocelyn)

> I very much prefer to be given a goal to achieve and some guidelines of how to do it and then be allowed to work out the rest of it myself. (Harold)

Those that have this SJ combination have what is referred to as the "Guardian" temperament. They want things to be predictable, liking "standard operating procedures to protect and preserve. … [They] trust the past, tradition and authority" (Myers, 1998, p. 31). These learners will tend to follow the structure that's given and like the guidance. Harold's comment is interesting in that his J type preference indicates that a structure is important, his guardian temperament (SJ) indicates a requirement to be given that structure, and yet his clarity of extraversion is slight, so he will prefer to be given

guidelines and develop his own detailed structure for himself rather than be given more specific detail.

When the J type preference is coupled with introversion (i.e. I__J), learners will prefer their own structure, and while they will examine what is provided, they are more likely to develop their own structure than use what is provided, particularly if it clashes with their own ideas.

> The timetable's handy, even though I don't follow it, but I always [look at it]. It's good to be able to assess how far you are behind [laughs]. No, but there's, you know, you have to, with any course, you need some sort of structure to go with, like a timetable, because with any course, there's an art to leaving things out. (Patrick)

Patrick's comments here show the need for structure in his remark *"with any course, you need some kind of structure"*. In order to create his own structure he examined the structure provided with the unit, using this as the starting point to building his own.

For those with J type preference, the next stage in the development of the structure for their learning will be to construct an up-front plan. These learners will incorporate a range of elements into their learning environment to assist them with this planning, as can be seen in the comments below.

> The course outline, I always read that. As soon as that arrives I spend time reading that and just looking at dates and looking at an overview of what the topics are going to be. I find that a great way to study. Just to know what's coming up. … And then I like to look at what the assignments are. I like to plan. (Ben)

> I usually am pretty organized. I write everything down in my diary when it's due and have probably about a week prior [to the assignment submission date], have it written and complete. … If it's a research

> assignment for an essay or a written assignment like that, I guess I spend a lot of time actually planning the layout of the essay. (Kirstie)

> I prefer to go [to the lectures] with notes and so I can, and have them read, add to them, do the required reading. And usually if you've got the reading up beforehand, you know what you read before the lecture and it's better to clarify everything that you've read and, or make things more clear. (Patricia)

Here Ben has used the outline structure to determine what is to be studied when, what topics are coming up in the unit and what might be required for assignments, enabling him to plan ahead. In a similar way, Kirstie has used the timetable to plan ahead so that she is able to schedule her work completion with ample time, while Patricia adds extra supporting elements to her planning and preparation for lectures. This up-front planning allows those with J type preference to feel in control of their environment, the timing of the events that occur and a sense of being prepared for their learning, features that are a necessary part of this aspect of their personality type. The planning process may be taken even further with the use of contingency plans as shown in Veronica's comment below.

> I try to prepare assignments well in advance anyway for my own peace of mind. … I like to have some contingency up my sleeve in case, you know, life gets in the way and things like that, which has happened over the last six years. So yeah, it's a fairly structured approach, I think. (Veronica)

For Veronica, who has a clear preference for Judging orientation, up-front plans by themselves are not enough and there is a need to go one step further and incorporate contingency plans as well.

For those who also have sensing perception, they will often have a step-by-step approach as part of their plan that separates the work into categories that they systematically work through.

> There are 10 tasks per week, so I try and complete a task a night, which sounds ridiculous because there's only seven nights in a week, but some of them are very much, read this as one task and the next task will be answer these questions, so that in my mind becomes one task. (Julia)

> I put them into my own little subjects. I've got the grammar section, I've got the CD's I've got to do, um, so I always leave the grammar part 'til last. (Barbara)

Both Julia and Barbara are J types with sensing perception. Julia's approach, as can be seen in the above comment, used the weekly tasks as her categorization, apportioning time to each task. Similarly, Barbara also categorized her work into sections, this time basing it on a cognitive grouping. This detailed planning is well illustrated in Derek's comment below regarding his approach to assignments.

> I will start off with, I guess with a thought or a direction I feel I want to go with it and um, brainstorm in my own mind, I generally won't write it down, but brainstorm in my own mind where I'm probably going to find that information from and dive in and start looking for it. So I guess when I'm doing an assignment or any other sort of set work I guess that my first point, my starting point is usually always my computer – a blank Word document where I can start writing down, you know, getting some information from some of the theories, some of the resources, uh, you know, if I see points that I feel are important I'll generally type them straight in so I've got them as a you know, a point of reference as I, you know, extrapolate on them and start expanding my own thoughts on that particular topic so, um, so I dive in pretty quickly. I don't generally sit back and do a lot of reading or anything first. (Derek)

This comment shows his clear preference for judging, particularly his last comment regarding minimal exploration of information. When set a particular task, the J type personality will focus on "getting the job done".

Supporting this desire for structure, categorization and a systematic approach to their learning, those with a J type preference will have a physical learning environment that reflects these requirements.

> Pretty much my desk, that's my study environment. And it's got all of my books there that I need. I don't have to go anywhere else for it. So it's got everything there that I need, including, you know, all my pens and things as well. So when I'm studying I don't have to move out of there, otherwise I can get distracted. (Jocelyn)
>
> I hate clutter. I mean if my desk has got mess on it in the morning or evening or wherever it is I'm going to be doing some work, I have to clean it up before I can get working. (Derek)
>
> I like to keep my desk very clean. I don't like to have stuff all over it. It happens when you study because I just put crap everywhere, but um, I like to have a very clean environment. (Barbara)
>
> With number one son having moved out, I now have his room, which I have set up as a study and it's my zone. It's a no-go zone for most of the other people in my house. And that just allows me to keep my stuff categorized in that, you know, that's a school pile, this a uni pile, that's a possible anything pile and so on and so forth. … Um, physically the room has a four-foot long table in it that is all in various processes of, you know, this one needs immediate, that one doesn't, so on and so forth; plus a desk, a computer desk where the computer sits and so on and so forth. So as I learn at this great big table I can swing round and post it to the lecturer or put in onto my computer ready to be posted as I

> go, rather than have this pile at the end of the week that has to be processed to be sent to the lecturer. (Julia)

As can be seen, there is a requirement for an uncluttered and organized physical learning environment, supporting their need for orderliness in their world.

In summary, those with a judging orientation to the outer world will look for organization and structure within the unit, incorporating this into their own structure for their learning environment. They will have systems and processes in place for their learning and assessment completion. They will create up-front plans and will have a physical learning environment that is uncluttered and organized.

6.4.2 Perceiving preference

For those with perceiving or P type preference, their "gifts of perceiving", in order of importance, are: spontaneity that enables them to make the most of the moment; an open-mindedness that leads to considering other options, even to the extent of reassessing decisions already made; a desire to understand others' viewpoint rather than pass judgment; tolerance that arises from a reluctance to settle things for others; curiosity that enables them to stimulate interest in almost any situation; a zest for experience; and adaptability, relying far more on spontaneous contingency plans than any up-front plan (Myers & Myers, 1995, pp. 71 - 73). Given the nature of these "gifts", those with perceiving preference, at first glance, may seem disorganized when compared with the judging types. They appear to leave things until the last minute and have little in the way of an up-front plan or schedule. This is not actually true. What happens is they get locked into their perceiving process, particularly for research assignments, and never feel that they have quite gathered all the information they need.

> I spend weeks and weeks getting all the references that I need and trying to understand it, and then formulating my thesis statement and my argument. (Kaitlin)

> I did spend a lot of time trying to find particular articles and everything, and then I was spending so much time on that I was running out of time just to um, get my assignment done. (Astrid)

These comments above show that expenditure of time and effort in collecting information (i.e. operating in their perceiving mode) dominates their learning environment, particularly for assignment preparation. Because the nature of the University system is one of semester units that often have tight time schedules, the perceiving type will often have difficulty with the University system, as shown in these comments from Joan and Angela.

> And then I like to come back and do a little bit more reading [when learning something new]. I do a lot of extra reading – [more] than I should really do. (Joan)

> … you'll probably see that I'm not scheduled, structured so much. I kind of do it as I need to do it, which I'm not sure is a good thing, but it's always been the way I've kind of worked. (Angela)

Joan comments that exploration is *"[more] than I should really do"*, while Angela is *"not sure [the dominance of her perceiving mode] is a good thing"*, as it makes it difficult to keep to the university structure that suits the judging type far better. As they value spontaneity, they are unlikely to consider the structure of the unit, or its content prior to starting it.

> Interviewer: How well did you find the structure of this unit and the approach that the lecturers used and the online environment obviously as well, how well did that match your approach to learning?
> Janet: I've never actually thought about it greatly. You know, its compulsory and I just do it. I don't really think about it.

> Interviewer: What did you know about the actual unit before you started it?
> Luke: Um, not much. I just sort of assumed that, since I was learning a language, most of the course would become apparent as I did it, so I didn't read up on it at all.
>
> Interviewer: What's your understanding of the aims and objectives of this unit?
> William: I haven't really gone into that. I just really go along with what's given to us really.
> Interviewer: No thoughts about what it's about?
> William: I'm open to them. Yeah. I'm just open to the information that's there. Not as such, no.

As these learners indicate, there is this sense of "going with the flow", allowing the unit to unfold as time passes. This spontaneity continues through to a lack of up-front planning in their learning approach.

> We've had exams for our minor studies. I did Psychology, and the exams for that, well, I'd basically cram at the end. I wouldn't do the readings or whatever through the semester. (Esther)
>
> If I'm really, really struggling I will look for a resource to begin with, but the rest of the time I have my idea of what I want to write or how I want to go or I just start typing and see what happens. (Brett)
>
> For the end of year exams, I usually try and have the day off before to study. But otherwise yeah, I'll study as much as I can, but quite often that's not enough. … Usually there'll be going through summaries in the textbook to all the chapters. Having a quick look at some of the readings that I wasn't too sure on, but I've usually got enough time to read through the lot. It probably wouldn't make any great difference to my thinking anyway. Then sometimes I don't even get down to doing that

> much. I've just got to try and work on hopefully learning it during the year, which is not good. (William)

There is a sense of doing whatever comes to mind, seeing what happens and hoping that they have done enough, rather than putting a strategy in place for their studies. As a consequence they look for guidance from others and may find the online learning environment difficult, as a greater level of self-direction is needed.

> … the way I think I learn best is if I probably do like to be told a little bit too much how and what and probably more how I should be thinking … all the materials to be pointed out where I should go to look for that and what to focus on. (Angela)

> I find that with this being online I have to, it's more of a responsibility on my behalf to go and seek out this information. That doesn't make sense though, because I have to do that anyway, but um, when it's face-to-face you've got someone telling you what to do, sort of thing, but when it's online I've got to try and find it myself. (Kaitlin)

> What I think is that unless it was a specific date that it [the online activity] needed to be finished by, then it should have stayed open and, you know, people could still chat about it at the later stages. You know, I mean, you all find out further information along the track. (June)

Here we see Angela and Kaitlin both looking for outside guidance and the provision of some structure for them. June actually missed posting her comments for a group activity as the group's response had been posted and the discussion closed (people could read but not post) before she got to contribute. Her comments indicate the desire for a more flexible structure that would allow her to continue working in her perceiving mode at a time that suited her. This focus on spontaneity and adaptability, with an absence of up-front planning, will lead them to include those elements in their learning environment

that require less planning, or rely on others to keep them on track in terms of meeting unit requirements.

> … probably no-one would be in that chat room if I do want to chat … a better method for me is to post something on the bulletin board and then in a day or two days I can come back to it and see if anyone's posted their response back. … I suppose, if you want to go on the chat room you've got to plan a time and stuff. (Angela)

> If you're asking did I have a system? There was no system [to the way the elements of the environment were used]. It was just doing what I could whenever I could really. If I was able to have access to a computer, I'd get on MUSO and read the forums, and then at other times, when I didn't [have computer access], I'd have my books out reading and making notes. (Astrid)

> Well, communication's pretty important to me because often I'm a bit lazy and so, for example, in the unit outline, if it says you have to do this, this and this; I won't know about it until it's too late. So talking to my friends is very useful in sort of getting me to do what I have to do. (Janet)

As we can see, Angela found the asynchronous online communication more to her liking than the synchronous chat, in that it enabled her to communicate without having to plan up-front. Astrid would use whatever was at hand at the time, and Janet used her friends to inform her of requirements and keep her on track.

When we look at those with perceiving type preference and their physical learning environment we see an environment that relates to their sense of spontaneity and lack of structure and order.

> Um, computer, bookcase, filing cabinets, books all over the floor. It's a real mess when I'm studying because I've got open books everywhere,

> and when I finish the unit I pack them all up and put them back where they go and tidy it all up. (Astrid)
>
> It's a very, very messy desk, which I have to clean up at some stage, because I've finished [the unit]. (Brett)
>
> That would be three times the size of this office, so that's just mine. And it's got a big desk at one end from one side to the other. And so I try to clear all my art stuff away and that becomes my learning [environment], you know. It's got all my books laid out there, and I progress to the kitchen bench, you know, when I'm really heavy into an essay. Everything's all over the kitchen bench because I'm constantly making notes of ideas and what have you. (Mandy)
>
> I've got my own little office at home and I like to spread everything across my desk and I probably would have maybe four or five different readings across my desk that I've photocopied. (Joan)

During the process of learning, materials will be close at hand but will have very little order to them. Those with P type preference will recognize that this appears messy, but they will be able to work with this disorder, unlike those with judging preference who find the disorder disruptive. Those like Astrid and Brett, who are introverts (i.e. I__P), have their perceiving dimension as their secondary function with their dominant introverted dimension being a judging function. As a consequence they will need to go through the process of "tidying up" after the study comes to an appropriate end point (i.e. the end of the unit) to satisfy the closure aspect of the judging function. Those like Mandy and Joan, who are extraverts (i.e. E__P), have their perceiving dimension as their dominant function. As a consequence, they will have a need to spread out, using all the available space, and are unlikely to ever see the need to "tidy up". This is supported by Ellis' (2006) research which found that, those with E__P type preference would, when not restricted to a single sheet of paper, invariably use more than one sheet of paper to draw their physical learning environment.

There may also be a sense of partitioning the physical environment off from the world for those with perceiving type preference who are also introverts (i.e. I__P), as can be seen in the comments below.

> I put a lot of work into trying to have an environment at home that I can hide in. … I have, um, got my own little study. I've got a little room with my books and my computer and I go in there and that's it. The rest of the world is somewhere else. (Phillip)

> My physical learning [environment]? At the moment it's a corner of the lounge room, so I'm with kids and TV and everything that's going [on]. It's quite typical. (William)

Despite William's environment being within the shared room, it is not integrated within the room, being allocated to a separate corner. This is consistent with research conducted by Ellis (2006) that showed that those with an I__P preference all used only a portion of the sheet of paper to draw the representation of their physical learning environment, showing a clear separation of their learning environment from the rest of their activities.

In summary, those with a perceiving orientation to the outer world will spend a large amount of time in their perceiving mode, and will incorporate a larger number of information resources into their learning environments. They will struggle with structures and timetables, often relying on others to provide them with necessary information relating to completion requirements and times for assessable work rather than developing plans. Their physical learning environments reflect their spontaneity and lack of structure, spreading out in the case of those who are also extraverts, and being partitioned off from the world in the case of those who are also introverts.

6.5 Summary of personality type

Table 13 provides a summary of the aspects of the learning environment categorized for each of the four dimensions: Extraversion/Introversion; Intuition/Sensing; Thinking/Feeling; and Judging/Perceiving. It should be noted that not all features listed in the table are relevant to all dimensions. Also, while some features are used across both dichotomies within a dimension the purpose of their use is quite different. For example those with intuitive perception use communication for the discussion of theories, concepts and ideas, while those with sensing perception use communication to collect data and information and share knowledge. The findings discussed in this chapter suggest that personality type shapes learner needs and strategies, which in turn, influences how learners approach the construction and use of their learning environments to ensure they are successful in meeting the learning objectives of the unit.

Table 13: Summary of the impact of personality type on aspects of the learner's learning environment

Personality Type	**Information Resources**	**Communication media**	**Activities**	**Communication**	**Connection with lecturer**	**Physical Environment**
Extraversion (E)	Greater focus on people sources	Prefer face-to-face but will use other forms when face-to-face not available	Those that involve other people	Have extensive networks of people		
Introversion (I)	Greater focus on reference materials and information sources	Prefer asynchronous forms such as email and asynchronous discussion	Like individual activities	Prefer small group to large group settings		
Intuition (N)	Use study guides and textbooks to provide an overview. Use resources that provide conceptual framework and linkages.	Extraverted intuition prefers face-to-face; Introverted intuition prefers asynchronous forms.	Use mind maps; discussion of ideas.	Used to explore possibilities and share ideas		
Sensing (S)	Use resources that provide facts and information. Like to add concrete examples	Prefer forms that allow nuance to be collected through the senses – text-based technological media may impede this.	Those that have a practical application.	Used to collect information and share knowledge		
Thinking (T)	Use resources that aid understanding			Used to come to conclusions about their learning	Made through the objective information that is provided	
Feeling (F)	Use resources that "feel" right	May lose the connection with others in the online asynchronous discussion environment. Feeling combined with sensing need physical connection in communication.		Used for support and to check their conclusions with others	Made through a personal relationship	
Judging (J)	Use study guide and timetables to provide structure		Use systems, processes and up-front plans			Uncluttered and organized.
Perceiving (P)	Large amounts of information sources			Rely on others to keep them "on track"		Disorganized; coupled with extraversion will spread out; coupled with introversion will partition off from the world.

7 Chapter Seven – Discussion

The construction and use of the learner's learning environment is very complex in nature. Taking the three drivers analyzed (the six categories of primary impetus to learn, the five gradations of self-perceived technology ability and the eight major functions of the personality type) we end up with 240 different learning environments. This happens because the impetus to learn and personality type as determined by the MBTI impact on the learning environment independently of one another and so have an additive effect when combined. Self-perceived technology ability will temper these two, enhancing a particular characteristic away from technology for those with lower self-perceived technology ability, and towards technology for those with a higher level of self-perceived technology ability.

While there are similarities across these 240 different combinations, all are unique. For example, when looking at those with a career impetus to learn combined with personality type and self-perceived technology ability (see Appendix D for this breakdown), we see that these learners will all make use of resources provided by the unit, adding information sources and people networks from their work environments to their own environments. However, those whose preference is extraversion are more likely to focus on the use of communication with others, while those with a preference for introversion will make greater use of information resources. If the level of self-perceived technology ability is lower, communication is more likely to be face-to-face and information sources are more likely to be print-based, while those with higher levels of self-perceived technology ability make greater use of technology-based resources and online communication.

Given that these three drivers are only some of the factors that impact on the construction and use of his/her learning environment (e.g. other factors such as secondary impetuses to learn, clarity of preference on MBTI, combinatory effects of the functions of the MBTI, time constraints and other intervening factors) we end up with a unique environment for every learner. This is not particularly helpful when considering

the implications of the construction and use of the learner's learning environment as it relates to their education in a University setting.

These drivers can, however, be discussed in light of their impact on, and relationship to, other features of learning environments. The model of learning environments presented in chapter two of this thesis (see Figure 9 below) showed the view of learning environments from the construction and use of the learning environment as determined by the educator/educational designer (i.e. the outer circle of the diagram); the learner constructed environment (i.e. the inner circle) as presented in the analysis chapters of this thesis; and the use by the learner of the provided elements of a unit (i.e. the middle circle), which provides the link between the educator constructed environment and the learner constructed environment. What follows in this chapter is a discussion of the learner constructed environment (as identified in this thesis) as it relates to each of the three features (i.e. pedagogical approach, learning environment design, and individual elements) of the provided learning environment for a unit of study at University. The discussion begins with the learner constructed environment and the pedagogical approach.

7.1 The learner constructed environment and pedagogical approach

The literature that relates to research about pedagogical approaches and learning environments can be separated into two main groups. The first group is that of research into the pedagogical approach, with little or no reference to the actual learning environment this engenders. For example, those researching authentic learning environments will refer to the environment in terms of the authentic context (Jones, 2006), access to experts or environments that allow the collaborative construction of knowledge (Kenton et al., 2004). This research into authentic learning environments imply a particular type of learning environment, but make little if any specific reference to the actual environment and its elements being used (see Section 2.2.1 on authentic learning in chapter two of this thesis).

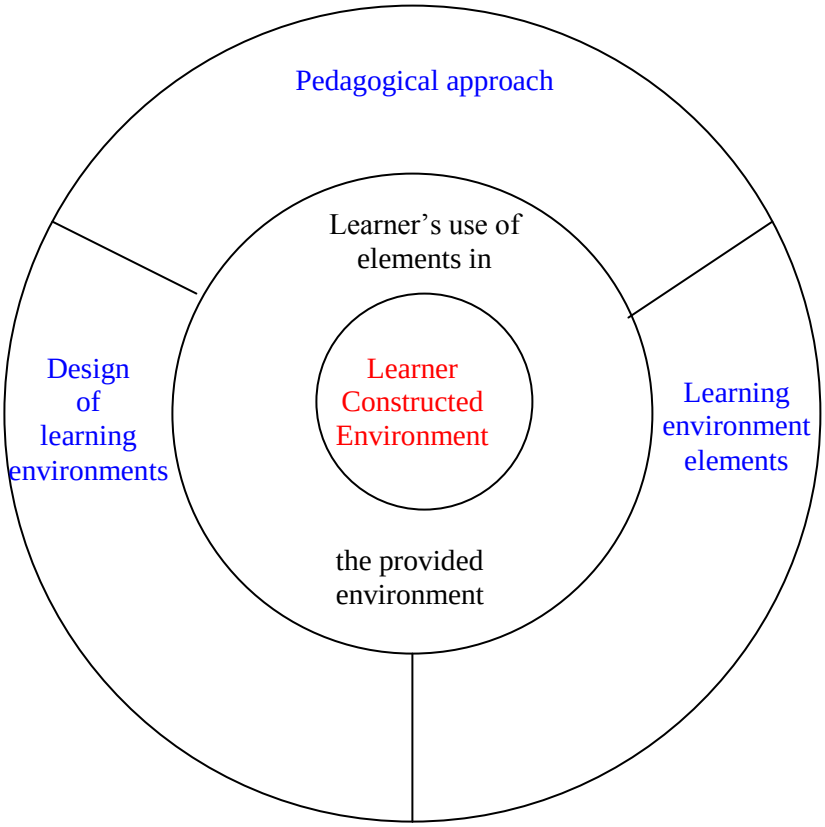


Figure 9: Model showing aspects of learning environments

The second group of research about pedagogical approaches and learning environments is where the pedagogy has driven the construction of the provided environment, and a specific environment has been set up to match the pedagogical approach. They demonstrate in their research how such environments support the pedagogical approach, and how these environments might be used, but there is minimal, if any, investigation of the actual use of the environment, and none from the learner's own construction and use of his/her environment. For example, Keppell (2006) describes the use of media triggers

within the PBL pedagogy, even suggesting how these may be incorporated into the environment, but there is no research on their actual use by learners. Similarly Freeman and Walrod (2007) describe the use of videos that detail a patient examination from the doctor's perspective, for use within case-based learning, suggesting how these videos might be used and the potential impact on student learning outcomes, but with no research on their actual use.

What this research does not examine is how particular pedagogical approaches will impact on a learner's construction and use of his/her learning environment that incorporates both the environment provided by the unit as well as his/her own additions. The discussion that follows addresses this, drawing on the analysis presented in the earlier chapters of the thesis and showing the combinatory effects of those drivers.

Pedagogical approaches such as authentic learning and problem-based learning focus on the use of real-world scenarios, and as such will provide an environment that includes aspects of the work environment. Such an environment will marry well with those learners who have a career impetus to learn, as their tendency is to include work-related resources in their own environment, and the engagement in role-play will suit those with extraverted feeling decision-making, as this meets their need for connecting with the external world through relationship. Some care needs to be taken over the assignment of roles, as a mismatch between the role assigned and the person taking on that role (e.g. gender mismatch, strong moral or cultural anathema to the character) may present difficulties for those learners with feeling type judgment, and may cause a disconnect from the unit and hence reduce the learning achieved in this situation. If the learner is well matched with the role, this aspect of role-play is likely to appeal to those with extraverted feeling as their dominant function, as this approach fits well with their need to talk to others and get a sense of the role they are taking on in the PBL scenario, thus encouraging a greater interaction within the unit environment. These pedagogical approaches also use more open-ended scenarios or ill-defined real-world settings for their assessable work and exploration of the concepts of the unit, thus fitting well with those that have an interest impetus to learn – these learners build environments that

enable exploration of areas of interest in more detail. The authentic learning environment also supports those with sensing perception, as they like to learn from real-world examples that also incorporate personal experiences. Those with a pass achievement, or unfocused impetus to learn, may struggle with this type of pedagogical approach that is more open-ended and learner-centered, as these learners tend to limit their environment to what is provided, and may struggle to set up an appropriate learning environment that relies on them adding more of their own resources in order to engage fully with the unit.

A didactic pedagogical approach is more likely to meet the needs of those with a pass achievement impetus, or those with an unfocused impetus, who particularly rely on direction from the lecturer and tend to limit their own environment to that provided within the unit. This type of approach, particularly if very proscribed, is less likely to suit those with an interest impetus to learn, who are more likely to move outside the provided environment to satisfy their requirements to explore areas of interest.

7.1.1 Example of combined effect of drivers and the pedagogical approach

As an example of this relationship between a pedagogical approach and the combined effect of the drivers, we can look at the learning environments developed by two participants in this study, Derek and Mandy, who were both enrolled in the Child Development unit, which utilized a PBL approach. These two learners have a different category of driver for all three drivers, and the learning environment they each constructed was markedly different.

Derek has an interest impetus to learn, a high level of self-perceived technology ability and a personality type identified as ISTJ (introverted sensing perception with extraverted thinking judgment). Table 14 outlines the details of Derek's drivers, unit enrolled in and student type (on or off campus). His interest impetus to learn lends itself well to the unit as he indicated a personal connection through his own family with the content of the unit, hence engendering a desire to explore the problems provided in the scenario within his own family as well as with the lecturer and his peers, thus

developing a rich environment for discussion. His sensing perception connected well with the PBL approach of the provision of a concrete real-life scenario, which suited him better than a more theoretical approach to the unit might have done. His objective thinking judgment enabled him to handle the role reversal (his role in the scenario was that of the mother of the child) and decisions in the scenario he was required to make. Also, his high level of self-perceived technology ability enabled him to utilize the online discussion environment to converse with other students who were taking the same role in other groups, thus further extending his exploration of the content of the unit through the scenario. He also made good use of other technology resources such as email for discussion and sharing of documents within his own assignment group, with his introversion matching well with his extensive use of the internet for resources that linked well with the textbook and the content of supporting lectures.

Table 14: Derek's drivers, unit enrolled in and student type

Impetus to learn	Interest
Self-perceived technology ability	High
Personality type	ISTJ (introverted sensing perception with extraverted thinking judgment)
Unit enrolled in	Child Development (PBL pedagogy)
Student type	On campus

Mandy, by contrast, has an unfocused impetus to learn, a low level of self-perceived technology ability and a personality type identified as ENFP (extraverted intuitive perception with introverted feeling judgment). Table 15 shows the details of Mandy's drivers, unit enrolled in, and student type.

Table 15: Mandy's drivers, unit enrolled in and student type

Impetus to learn	Unfocused
Self-perceived technology ability	Low
Personality type	ENFP (extraverted intuitive perception with introverted feeling judgment)
Unit enrolled in	Child Development (PBL pedagogy)
Student type	On campus

Her unfocused impetus to learn required more direction from the lecturer than was provided and she struggled with the learner-centered, open-ended nature of the scenario that the PBL approach provided, as can be seen in the comment below.

> She [the lecturer] doesn't feed you. You know, it's, you have to go and learn it for yourself. … Even the problem-based scenario and that's because we were left to our own devices … she [the lecturer] didn't actually help, didn't actually explain what we [had to do]. In the first two or three weeks we actually had no idea what to expect out of the subject. (Mandy)

She saw the lack of input from the lecturer as a hindrance rather than an opportunity to explore on her own. With this impetus to learn she indicated she didn't add any other resources to those already provided, thus limiting her exploration of the unit, which the PBL approach is hoping to engender in the learner through its open-ended scenarios. As a learner with subjective feeling judgment, she struggled with the gender mismatch of her role in the scenario (her role was that of the father of the child), and her low level of self-perceived technology ability did not enable her to feel confident in exploiting the online asynchronous discussion to explore this role further. Her intuitive perception did not need the real-life scenario to aid her conceptual understanding of the unit content, and this, combined with the gender mismatch of the role, made the scenario seem even less "real" to her. Her use of the provided environment was limited to what she was required to do, such as required weekly readings and a minimum number of posts in the online environment, with no engagement in further discussion, adding to a disconnect with the unit in general. Derek's environment is much richer than Mandy's, both in terms of resources, discussion and exploration, which is likely to impact on his engagement with the unit and the learning occurring within that unit. In this situation, the pedagogical assumptions of PBL (i.e. that the learner will take responsibility for their learning in constructing their own understanding through engagement with the problem, the collaborative nature of the solution development and the role of the lecturer as one of facilitator) would be better informed by a recognition of the nature of the

environment constructed by the learner. In Derek's case the pedagogical approach matched well, but in Mandy's case it matched poorly.

In summary, we see that the pedagogical approach of a unit may have a bias towards a particular type of learning environment, and hence learners will be more comfortable with, and able to make fuller use of, those environments that match with their own drivers. We also see that by understanding the nature of the drivers that impact on the learner's construction and use of his/her own learning environment, the environment provided can be better informed in relation to the pedagogical assumptions of the particular pedagogical approach used. The next section explores the learner constructed environment in relation to the intentional design of the provided learning environment.

7.2 The learner constructed environment and design of learning environments

We have seen in the literature that the intentional design of learning environments, whether it be driven by pedagogy (Hedberg, 2002), use of the technology (Albon & Trinidad, 2002), aspects of learning (Bernard et al., 2000; Burch, 2001; Chiu & Hsu, 2004) or the physical and virtual aspects of the environment space (Cavenagh, 2002; Gillette, 1999) is inextricably linked with the learner. There is also evidence that pedagogy drives the nature of the learning environment (as seen in the previous section of this chapter), and that the learning environment structure to some extent determines the nature of the pedagogy (Jaffee, 2003) and the aspects of learning that takes place (Norman, 1998). What is not reflected in the literature is how the learner reacts to this design in relation to his/her own drivers, and what impact this has on the construction of his/her own learning environment. Those researchers who have explored the construction of adaptive learning environments (i.e. where the content accessed, the feedback provided and the nature of the human computer interface adapts to characteristics of the learner, the learner's use of the environment or the choices of the learner) are moving towards a closer association of the design of the provided environment with the learner's use of that environment (Castillo et al., 2006; Joung, 2005). However, there are limitations with this, as this adaptation only occurs in online environments, and the focus is still on the provided environment, ignoring those aspects

of the provided environment which the learner chooses to reject, the features the learner chooses to add to his/her own environment and the drivers behind those choices. The discussion that follows addresses this, drawing on the analysis presented in the earlier chapters of the thesis, and showing the combinatory effects of those drivers in relation to the design of the provided environment and the learner's own constructed environment.

The provision of links to information resources that provide a career focus in relation to the content of the unit will encourage those with a career impetus to learn to utilize the provided environment rather than looking externally. Herrington, Herrington and Oliver (1999) illustrate this connection of the learner to resources through the career focus, in their provision of Web resources that directly relate to the practice in the work environment – in this case pre-service teachers. They found that the learners "gain a sense of how best the resource could be used and the real advantages that could be gained through its use" (p. 168). This is also true when incorporating discussion environments. If the opportunity to engage with external experts in their chosen field is provided, then these learners may be more likely to engage in discussion within the unit rather than seeking connections outside. Similarly, provision of opportunities for those already engaged in the field of work to share their knowledge and insights within the provided discussion environment, as well as designing discussions that use career-related field work (e.g. teaching rounds for education students, visits to another country for language opportunities) are likely to encourage those with a career impetus to learn to utilize these discussions, and to build their own learning environment within the framework of the learning environment provided with the unit.

Provision of links to resources that provide further exploration of topics, both in terms of extending the topics covered in the unit and coverage of related topics not directly covered in the unit, will provide an environment that is more likely to be utilized by those with an interest impetus to learn. If opportunities for choice within the unit are included, those with this interest impetus are likely to be able to find aspects of the unit that spark their interest. There is also a need to incorporate into the design of the unit

time opportunities to explore, as these learners will need this time to carry out their explorations.

Learners with pass achievement or unfocused impetus to learn require a greater level of structure in the given environment, tending to limit the construction of their own environment to what is provided. Those with an assessment impetus to learn also require a greater level of structure in the provided environment, limiting their own environment to what is directly associated with assessment. Where there is a unit that links the unit objectives, content provided, resources, activities and assessment, learners with these three types of impetus to learn are likely to engage more fully with the environment provided and incorporate the relevant elements in their own environment in order to learn. Clear assignment guidelines – with a clear indication of the pass requirements with links to associated resources that will assist in achieving a pass – while being useful for all learners, will particularly assist these learners whose impetus to learn is assessment, pass achievement or unfocused. Those with the guardian temperament (i.e. SJ combination) will also particularly benefit from clear linkages across the different aspects of the unit and clear assessment guidelines, as these learners need help to construct an overall view of the unit and need to know "up front" what is expected of them. If there is a mismatch or lack of linkage between these items, or a lack of clear guidelines, these learners may have difficulty choosing which items to include in their own environment, and may miss information crucial to their learning. Those with assessment impetus to learn are likely to ignore aspects of the environment that do not appear directly relevant to the assessable work; those with pass achievement impetus to learn will use only those aspects that enable them to achieve a pass; those with an unfocused impetus to learn are likely to only use aspects of the environment when directed to do so; while those with the guardian temperament may not see the connections across the unit, and are likely to get frustrated with the lack of guidance and hence not engage fully with the learning in the unit.

If, however, the structure of a unit is too rigid, particularly in the timing and completion of assessable work (e.g. weekly assessment tasks), those learners with a perceiving (P)

type personality may struggle as they try to work within time restrictions that may not allow them to fully satisfy their need to explore and gather information (i.e. to operate in their perceiving mode) in order to complete the assessable work. This can be particularly problematic when there are assignments due for a number of units at the same time. Some opportunity to continue discussion, or a more flexible assessment system such as a learning contract that gives the learner more control of the development time of an assignment, may help alleviate this situation.

While the didactic pedagogical style will suit those learners with an unfocused impetus to learn, a design using this pedagogy that has little active participation for the learner may cause these learners to disconnect with the learning environment. These learners rely on the external direction from the unit, and in a unit with no active participation on their part, their role is a passive one, and they, unlike those with career, interest, high achievement or assessment impetus to learn, are less likely to change their own environment to make it more active. Any tasks set within the unit take on a greater significance in determining what work is done, and therefore what learning occurs, as their environment will be limited to those resources needed to complete these set tasks, whether assessable or not.

Units that are designed with extension work in mind will be appealing to the learner with a high achievement impetus to learn. Ways to ensure this work is satisfactorily incorporated into the learner's environment are: to provide links to resources that support the extension work; a clear delineation between required work and extension work; guidelines that indicate the work effort required for such extension work; and clear assessment guidelines and good feedback; to reassure learners they are working towards the best outcome, especially if assessment is very open-ended. Bach, Haynes and Smith's (2007) work supports this aspect of providing feedback as an important part of the design of the online learning environment, noting that "personal feedback is a vital part of ensuring that a positive feedback loop occurs" (p. 99).

A design that balances theoretical conceptual material and practical examples will suit both intuitive and sensing types. Units that are theoretical, abstract and symbolic in nature will be more difficult for sensing perceivers. The design of these units needs to make thematic and conceptual elements explicit for the sensing perceiver, as they may have difficulty identifying themes on their own. The incorporation of practical applications or concrete examples, that bring the content out of the purely symbolic and into the concrete world, will also provide an environment that assists those learners with sensing perception. When there are large amounts of detail to cover, those with introverted intuitive perception will need time to assimilate this detail on their own. A design that provides an overview with themes clearly identified, with linkages to make sense of the detail (e.g. the provision of a model or image of a completed artifact before the learner is expected to construct that artifact in class from the detailed parts), and the provision of the detail in both an extraverted way (e.g. in a class presentation) or in a take-away form (e.g. supporting notes) can assist both the intuitive and sensing perceiver.

An environment that is designed in an impersonal way, with an emphasis on information that largely ignores the building of relationship, will suit those with thinking judgment better than those with feeling judgment. If the design focuses on individual work and independent learning, this type of unit is more likely to suit the introvert, while group work is more likely to suit the extravert. If the design of the environment includes opportunities for relationship building within the group, this type of environment is more likely to suit extraverts and those with feeling judgment. These differences highlight a need to design an environment that balances these different approaches so that there will be aspects of the provided environment that sit well with each type of personality, rather than being biased towards one type.

The design of the environment, and the elements and resources chosen for that environment, may impact on the process of learning for those with sensing perception. If the environment changes from the physical to the virtual, those with sensing perception will see this as affecting the actual process of their learning, rather than the process

staying the same and only the resources used changing, as would be the case for an intuitive perceiver. If these learners with sensing perception also have lower levels of self-perceived technology ability, this may cause great difficulty in them establishing a new process for their learning that utilizes the new environment. If, when moving to a virtual environment, the mechanisms for using the new resources are made explicit and clear, and time is made for the learners to learn to use these new resources, those with sensing perception and low levels of self-perceived technology ability are more likely to be able to adapt their process of learning to incorporate this new environment. For blended learning environments that employ both online and face-to-face elements within the environment, good design that highlights how these are integrated within the provided environment would help learners integrate them better within their own constructed environment, especially those with lower self-perceived technology ability.

7.2.1 Example of combined effect of drivers and the environment design

If we look at two of the participants in this study we can see how the combinatory effect of their drivers impacts on the construction and use of their environment in relation to particular design approaches of a unit.

Julia has a career impetus to learn, a low to medium level of self-perceived technology ability and a personality type identified as ESFJ (extraverted feeling judgment with introverted sensing perception). She was enrolled in the Indonesian unit as a distance education student. Table 16 shows the details of Julia's drivers, unit enrolled in and student type.

Table 16: Julia's drivers, unit enrolled in and student type

Impetus to learn	Career
Self-perceived technology ability	Low to medium
Personality type	ESFJ (extraverted feeling judgment with introverted sensing perception)
Unit enrolled in	Indonesian
Student type	Off campus

The design of the unit included a comprehensive, well-structured website, with work separated into weekly thematic topic areas and associated activities, including a calendar of events and online asynchronous discussion forums in both English and Indonesian. It also included a CD-Rom that contained weekly activities, including audio recordings of Indonesian by both a native Indonesian speaker and an Australian. As well as these resources, the lecturer could be contacted either by email or phone, and there was a weekend residential component of the unit that allowed for face-to-face interaction with the lecturer and other peers. With her career impetus to learn, Julia included the audio resource on the CD-Rom into her own environment. She specifically commented on the access to the expert native speaker of Indonesian, but appreciated that the learner had been catered for as well, as can be seen from this comment.

> There's usually a conversation that's on CD so we can listen to what it sounds like. And [lecturer's name]'s been very clever in doing that as well in that it's a native speaker on the CD as well as someone who is Australian speaking Indonesian. So you get to hear how it should sound if you're a native speaker but what is acceptable as an Australian speaking Indonesian, which I think is very, very clever. … The CD travels with me between school and home. And it's something that I'll often do of a lunchtime is just put the CD on in my office as I'm doing stuff so that I'm hearing um, the bits and pieces. (Julia)

She appreciated both the expert nature of the native speaker, and also, in her career as teacher, the Australian speaker, which provided the support for the learner. As a consequence she incorporated the CD as a resource frequently into her learning environment, despite having low to medium self-perceived technology ability. She found, however, that her communication with others was through her career contacts, rather than through the asynchronous discussion forums, as the forums were designed for students enrolled in the unit to converse, which did not connect well with her career impetus to learn, as evidenced in the following comments.

> … here at school I'll speak in Indonesian when I'm talking to other Indonesian teachers. When I'm with my tutor at home I'll speak to him in Indonesian and as I say, I've got some other people at work that are in the community that can speak in Indonesian, so I go that way rather than supporting other students. … In visiting it [the Indonesian asynchronous discussion forum] I thought this to me on my very first visit just looks like I'm going to be marking kids' work. … that just comes across to me as sitting there with, you know, a piece of work from one of my own students going red arrow over there, and you know, crosses and ticks and all the rest of it. So it didn't grab me. (Julia)

Rather than seeing herself as the learner in the asynchronous discussion forum, she viewed it from the role as teacher (i.e. as if the discussion forum was one set up for her own students to use, with her in the teaching role). She does not appear to see her fellow students in the university course as her peers. So the design of the discussion forum, as a place for the students to have conversations in Indonesian and enable peering critiquing of work, conflicted with her career impetus to learn and her orientation as a teacher. As a consequence, she did not use the asynchronous forum after her first initial look at it. Her low to medium level of perceived technology ability and her extraverted feeling personality type probably contributed as well to reducing her desire to use the online asynchronous forum. Perhaps if the discussion had been designed to include Indonesian people from outside the unit it might have had more appeal.

For her the intentional incorporation of a weekend school married well with her extraverted feeling judgment and her need to connect face-to-face to form a relationship with the lecturer. She commented a number of times how organized she found the material, with the well-structured design of the unit matching well with her Judging (J) orientation, which looks for structure and order.

> Amazingly organized. When we look at all the student, study guides and the actual course material and the CD's and all the rest of it – amazingly organized. Very, very clear to follow and in looking through the set texts

> and reference texts. … [the lecturer] also puts in a week-by-week thing, so by the end of week one you should have done this task, that task and something or other else. And that's done by the week. The rest of the study guide is very much accessing information in the community. So the different resources, and that includes websites, community names, addresses, whatever it happens to be. Um, each assessable component gets a very, very clear write-up as to what's expected, how to go about it. (Julia)

This comment shows her appreciation of the organization of the unit, with clear expectations and instructions for completing the work. This fits well with her personality type, which needs formalized procedures and stability, together with precise step-by-step instructions (Myers, 1998). The unit's organization enabled her to access the provided resources easily and incorporate them into her own environment. So, in general, the design of this environment matched with Julia's drivers very well, enabling her to construct a rich environment for herself.

Catherine, a learner with a career impetus to learn, but with a medium level of self-perceived technology ability and a personality type identified as ISTJ (introverted sensing perception with extraverted thinking judgment) was enrolled in the Integrated Curriculum unit, which was designed quite differently. Table 17 shows the details of Catherine's drivers, unit enrolled in and student type.

Table 17: Catherine's drivers, unit enrolled in and student type

Impetus to learn	Unfocused
Self-perceived technology ability	Medium
Personality type	ISTJ (introverted sensing perception with extraverted thinking judgment)
Unit enrolled in	Integrated Curriculum
Student type	On campus

This unit was an on-campus unit with a weekly three-hour face-to-face class and a WebCT website, which incorporated online asynchronous discussion forum, a

synchronous chat facility, email, access to readings and other online resources, and weekly interactive tasks, which were assessable. As Catherine was an on-campus student, the online chat facility was seen as irrelevant.

> I've seen two girls involved in a chat room sitting side-by-side telling each other what they're going to type into the chat room. And it just seemed a bit strange to me really. It just didn't seem to make sense if you can have the conversation [face-to-face], and to me the conversation is going to be more important than typing stuff into a computer. … For me the relationship is more important than the tool, and that's the way I regard computers. It's a tool, not a means of establishing a relationship. (Catherine)

Her comment *"the relationship is more important than the tool"* reflects her sensing perception, as the physical nature of the computer for her would get in the way of her communication with the other students.

The design of field work (i.e. teaching rounds) incorporated into the degree course married well with her career impetus to learn, as she had access to professionals in her school placements. It also matched well her sensing perception, which places an emphasis on the real world with the opportunity to gain practical experience within the work setting. However, the design of the discussion environments in the unit focused on specific assessable tasks rather than an opportunity to extend her exploration of the professional work environment. As a consequence, she added her own face-to-face discussion environment with others who had similar interests (i.e. the other mature-age students) in order to explore further the aspects of her career as experienced on her teaching rounds.

> … all the mature age students congregate over a cup of coffee. We have some quite rousing discussions about teaching and learning and our processes of teaching and learning. Students' processes of teaching and learning and things that we might have seen in schools … (Catherine)

This comment highlights the career focused nature of the discussion. She also indicated a preference for face-to-face discussion, influenced by her medium level of self-perceived technology ability and her need for non-verbal concrete cues when communicating.

As the assessable weekly tasks were required to be completed through the WebCT LMS, this design led her to struggle with marrying the use of the computer with her learning within the unit. Once again, her medium level of self-perceived technology ability, combined with her sensing perception meant that the physical nature of the technology got in the way of her learning, as can be seen in the following comment.

> So we have to do, one of the assessment tasks is the chat rooms and stuff like that and then we have to do a multimedia presentation to our tute group in a group. And so we choose an area of integrated curriculum and create a question around that and address that to a multimedia presentation, which can be, well PowerPoint, I suppose, at the most basic, though they encourage us not to use PowerPoint. And to go to other programs and things like that. (Catherine)

The elements of the environment became the tasks she had to do, with the tool being used dominating the activity. This was exacerbated by the unit design requiring the use of certain media to complete the assessable tasks.

The design of the WebCT site, with its focus on the assessable tasks, also meant that the resources were aligned with those tasks, prompting Catherine to need to investigate resources outside the provided environment.

> I think it's fairly limited to address specific tasks. So on the WebCT for the integrated curriculum there's readings, there are set readings that we're supposed to read. And as far as that goes, that's basically the only resource provided through the WebCT. (Catherine)

As a consequence, Catherine collected a range of resources which she added to her environment, including Internet resources, library resources and material gathered in school which she identified as being useful in her career later on.

In summary, we see that design considerations influence the way a provided learning environment is constructed and are likely to have an influence on how the learner constructs his/her own environment. If the design supports the drivers that influence the learner's learning environment, the provided environment can satisfy the learner's requirements. If, however, the design does not support the learner's drivers, this can cause the learner to look outside the provided environment. Design considerations that support those drivers that influence the learner's learning environment, by providing not only a range of different elements, but a range of different ways in which they are intended to be used, will best ensure that learners' environment needs are catered for. The next section focuses on these individual elements and how they relate to the learner constructed environment.

7.3 The learner constructed environment and learning environment elements

The literature relating to the specific elements of a learning environment can be separated into two main types of investigation. The first is that of the element itself, whether it be cooperative groupwork tools (Holtham et al., 1998), Learning Management Systems (Crawford & Kevill, 2000; Sawers & Alexander, 2000) or computer-mediated communication (Boora et al., 2005; Cartwright, 2000; Day & Batson, 1995). These investigations looked at the nature of the tool itself and what it could provide, often comparing it with the more traditional educational resources such as face-to-face tutorials and discussion groups, lectures or seminars to see if it was effective. The investigations often focused on the "usefulness" of the product as reported by the student, or what features it provided to support learning rather than how the learner actually made use of the element and why. For example Macauley, Shaikh and Young (1998) found the cooperative groupware tool good for document sharing but not for communication, while (Ellis, 2001) found online asynchronous communication

provided flexibility and opportunities for reflection but lacked the visual cues and immediacy normally associated with face-to-face communication.

The second type of investigation is into the use of the element in the provided environment. These investigations are moving closer to an understanding of why and how the learner makes use of such elements, moving from general perceptions of an element (Tichon et al., 2004), the value a learner places on elements of the environment (Ausburn, 2004) through to general levels of use of particular elements (Chmiliar, 2010) as well as specific usage associated with learner characteristics (Becker & Dwyer, 1998; Huang et al., 2008). While this analysis of the use of elements is slowly moving towards a closer association with the learner, the approach of the research still commences with the element that is provided, with little or no consideration of additional features of the environment that might be added by the learner to their own learning environment, nor is there consideration of the reasons or drivers behind the learner's way of using that element. These investigations also often focus on a comparative analysis, comparing the usage patterns of what is considered a new element (e.g. one comprising computing, online or mobile technologies) with the more traditional learning environment of the face-to-face, lecture/tutorial environment, as if this traditional environment is somehow a fixed environment without possible variations in its use, and hence any differences that occur are due to the newer technology. The discussion that follows addresses these investigations of the elements and their use, drawing on the analysis presented in the earlier chapters of the thesis, and showing the combinatory effects of those drivers in relation to what impacts on the incorporation of those elements into the learner's constructed environment, and how they are utilized.

The finding of this study suggest that, when educators/designers are considering what elements to include in the unit learning environment, careful consideration needs to be given to the way in which the learner will approach the use of those elements when constructing their own learning environment. There is also a need to ensure the different elements of the environment (e.g. unit objectives, assessable items, resources provided, lectures and associated materials, tutorial environments, online synchronous and

asynchronous discussion forums) link well together to form the unit learning environment, and that this is made explicit for the learner. All learners will benefit from this, but this is particularly crucial for those with an unfocused, pass achievement or assessment impetus to learn, as these learners will tend to use what is provided, are less likely to add their own resources to supplement the environment provided, and are likely to discard provided elements unless they can see a direct relevance to the assessable work.

Those elements that utilize technology need to be carefully considered in their inclusion in the environment, particularly in relation to enabling the learner to build their confidence in using the technology and raising their level of self-perceived technology ability. Learners will revert to what is familiar if they are not provided with appropriate support to take on a new technology, or if the cost (time)/benefit (learning outcome) outcome is poor; thus those with lower levels of self-perceived technology ability will gravitate towards the use of print based resources and face-to-face communication rather than spend time learning to use the new technology, even if the new technology would match well with their impetus to learn or their personality type. They will avoid using the new technology, particularly if it is perceived as difficult to use, time consuming to learn, or its use and purpose within the unit framework is not made clear. This has implications for the inclusion of technology based elements within the unit's learning environment.

Training in the use of technologies is crucial, together with the provision of time to learn to use such technologies. Dijkstra, Collis and Eseryel (1999) noted that, when using a course support site, students needed an initial demonstration of the site and how to use features such as shared workspace and file upload/download facilities. Formalized training is particularly relevant for those with a judging orientation, as they prefer clear instructions and an organized and systematic approach to learning something new, rather than learning by trying things out without formal instruction. For those with lower levels of self-perceived technology ability, training in quite simple skills may be required – for example, the concept of online and offline technology environments, editing,

downloading of information, use of library databases, searching and authentication skills for the Web, netiquette, threading and posting for online asynchronous discussion forums, and archiving and backup, to name but a few. One way of ensuring the training meets the needs of the learner is to assess the learners' technology ability prior to studying, so that the appropriate level of technology instruction can be given to equip learners adequately for their use of technology in their study at university (Milligan & Buckenmeyer, 2008). Another way of meeting training needs might be to include hurdle tasks that relate to learning to use the technology as a way of assisting those with lower levels of self-perceived technology ability to become more confident in the use of technology, particularly if such tasks are staged to suit the varying levels of self-perceived technology ability. This will also sit well with those whose impetus to learn is unfocused, pass achievement or assessment driven, as they need greater guidance in their use of the provided learning environment. The timing of such training is also important, as all learners do not necessarily start in the first semester of the first year of a course, and may miss out on this training if it is only available at the very beginning of a course. Explicit positive experiences through appropriate training can avoid the bad experiences that form a barrier to subsequent use for those with lower levels of self-perceived technology ability, as was identified in chapter five of this thesis. The provision of interfaces that are consistent across units in their use of icons and layout can reduce the technology learning load, as well as building a familiarity that is likely to encourage greater incorporation of such technologies into the learner's learning environment.

The provision of an information resource in a number of different forms (e.g. print-based, downloadable and online), enables the learner to use the information in the form that is most familiar to him or her and so encourages the incorporation of that resource into his/her own learning environment.

The online asynchronous discussion environment is an element that requires some level of active engagement from the learner for it to be of benefit within a unit, and therefore nature of the provided discussion environment needs consideration when being

incorporated into a unit's learning environment, as this may influence the learner's use of such an element. This influence is increased when the learner's self-perceived technology ability is low, as these learners are less likely to use this medium in the first place, and so the incentive to participate actively needs to be generated more strongly for these learners.

For example, those with assessment impetus to learn are less likely to use a particular element included in the unit learning environment unless they see a clear link to the assessment. In the online discussion forum, they are likely to engage only as a passive participant, if at all, unless they see it as a required activity for their assessable work. This does not necessarily mean that marks should be given for active participation in a discussion, only that there needs to be a clear link between the discussion and the assessable work.

If the discussion environment is set up to have questions answered by the lecturer, rather than as an interactive explorative discussion, those with a career or interest impetus to learn are likely to disengage with this element of the environment, looking for discussion opportunities outside the provided unit environment, as opportunities to discuss career related areas, or to explore areas of interest are not being provided. Those with an unfocused or pass achievement impetus to learn, who are looking for more guidance or information to ensure they are doing what is needed to pass, are likely to be passive observers of such a discussion forum. This type of forum is more likely to be used by those with an assessment or high achievement impetus to learn, using it to clarify assessment requirements and areas of understanding respectively.

If the discussion is of an interactive exploratory nature, with access to expertise from the career environment, this will help engage those with a career or interest impetus to learn. However, there is a danger that those with a pass achievement impetus to learn may disengage with such a discussion, becoming passive observers only, if they consider the level of discussion is getting beyond the level of knowledge that will enable them to

contribute. Such a discussion requires appropriate moderation to ensure participation is possible even when the achievement impetus is low.

Hewson and Hughes (2005) identified a range of phatic processes (i.e. establishment of identity in the class, getting to know others, adopting a communication etiquette and building relationships with others, particularly in the establishment of trust) that are required to support communication, recognizing that these processes need to be made explicit in the online environment. This is particularly important for those learners with a personality type identified as extraversion and/or feeling judgment, who rely on personal connection in communication, and may be reluctant to engage in discussion online if those personal connections are not developed, either through prior face-to-face contact or through appropriate mechanisms built into the online environment. This disconnect is likely to be increased if these learners also have a lower level of self-perceived technology ability, necessitating even more care in engaging the learner in the online discussion environment.

Where a unit is run totally online, the provision of online synchronous chat as part of the environment "affords both the instructor and students the opportunity to engage in real time discourse and dialogue" (Robertson & Klotz, 2002), and hence may satisfy the needs of those learners with feeling judgment where the relationship development is important. Its real-time nature also provides an environment that is extravert in nature and so is more likely to engage the extravert. Synchronous chat needs to be well managed, as poor timing of the real-time sessions can remove a learner's ability to engage in the session; large numbers of participants in a session can be intimidating for those who have lower levels of self-perceived technology ability; and poorly structured sessions with no real purpose will be problematic for those with a judging orientation, particularly when combined with sensing perception, as these learners thrive on the provision of a well structured environment.

Another element of the learning environment is that of the lecturer and the teacher-learner relationship that develops. Hodgson's (1997) work, where he refers to vicarious experience, illustrates this relationship. He indicates that vicarious experience

> differs from an extrinsic experience in that it does not seem to be associated with external demands and it differs from an intrinsic experience in that students do not quite seem to see the content in terms of their own view of the world and their understanding of it. Instead the student seems to relate more to something the lecturer offers, whether it takes the form of enthusiasm or an interesting and recognizable illustration or example. Vicarious experience is thus very closely linked to the lecturer, perceptions of the lecturer, and the lecturer's presentation (p. 168).

The lecturer's level of interest can affect a learner with an interest impetus to learn. Lecturer connection is also important for those with a pass achievement impetus, to provide assurance that the learner is doing what is necessary to pass, and for those with an unfocussed impetus, to provide direction for learning. A video can be used in a distance education environment to help develop this connection with the lecturer. It can enhance this "vicarious experience" for the learner by enabling the lecturer to show his/her personal passion for the unit content, and to provide much needed support. Residential components of distance education courses can also provide this lecturer connection. The balance between information provision and relationship development between learner and educator is also important in relation to personality type. For a more technical, objective unit that requires a greater emphasis on thinking judgment, the relationship built between the academic and student can be crucial for those with feeling judgment, while for more creative, subjective units where the emphasis leans more towards feeling judgment, the provision of quality information and guidance can be crucial for those with thinking judgment. The lecturer can also provide guidance in the choice of alternative resources, which will assist those with perceiving (P type) preference. These learners may become overwhelmed when too many choices are

provided and time is limited, and the guidance from the lecturer in narrowing that choice, presenting resources in terms of their value and relevance, can assist the perceiving type learner to stay focused on the task and not expend large amounts of time in gathering information.

7.3.1 Example of the combined effect of the drivers and the learning environment elements

If we look at two examples of some of the participants in this study, we can see how the combinatory effect of their drivers impacts on the inclusion or otherwise of particular elements of the environment and their patterns of use.

In this first example, June and Jocelyn both have an unfocused impetus to learn and a low to medium level of self-perceived technology ability, but their personality type differs. June was assessed as having an ENFP personality type (extraverted intuitive perception with introverted feeling judgment) while Jocelyn was assessed as having an ISTJ (introverted sensing perception with extraverted thinking judgment) personality type. Table 18 outlines the drivers, unit enrolled in and student type for both June and Jocelyn.

Table 18: June and Jocelyn's drivers, unit enrolled in and student type

	June	Jocelyn
Impetus to learn	Unfocused	Unfocused
Self-perceived technology ability	Low to medium	Low to medium
Personality type	ENFP (extraverted intuitive perception with introverted feeling judgment)	ISTJ (introverted sensing perception with extraverted thinking judgment)
Unit enrolled in	Technology for Education	Indonesian
Student type	On campus	Off campus

As they both have an unfocused impetus to learn, they have a similar need to be guided by the provided environment of the unit, tending to limit themselves to what is provided. June's dominant extraverted intuitive perception encourages her to follow up the provided links to gain more information, while Jocelyn only makes use of the actual

provided material unless the resources provided through the additional links are specifically required for assessment purposes. In Jocelyn's case, with a sensing perception, combined with the low to medium level of technology ability, the resources she makes use of are predominantly physical (i.e. actual books from the library). June also makes use of printed library resources, although with an intuitive perception which demands less connection with the physical, she also includes electronic journals and internet resources. However, she has been directed to these through links on the WebCT site, as her low to medium level of self-perceived technology ability does not encourage her to explore on her own. With a low to medium level of self-perceived technology ability, neither of these learners is inclined to use the asynchronous online forums; however June's extraversion encourages her to seek out informal communication with other students face-to-face, while Jocelyn, as an introvert, prefers to work alone. In this example we see similarities in construction of the environment of each learner engendered by the common drivers of their impetus to learn and self-perceived level of technology ability, with the personality type differences modifying the nature of the element or its use

In the second example, we can see how the drivers combine to influence the use of the elements Ben has included in the construction of his learning environment. Ben is a distance education learner enrolled in the Psychopathology unit with an interest impetus to learn, a low level of self-perceived technology ability and a personality type assessed as ISFJ (introverted sensing perception with extraverted feeling judgment). Table 19 outlines the drivers, unit enrolled in and student type for Ben.

Table 19: Ben's drivers, unit enrolled in and student type

Impetus to learn	Interest
Self-perceived technology ability	Low
Personality type	ISFJ (introverted sensing perception with extraverted feeling judgment)
Unit enrolled in	Psychopathology
Student type	Off campus

His interest impetus to learn encourages exploration of resources, with Ben making use of quite a wide variety of information resources. With his low level of self-perceived technology ability combined with his sensing perception and judging orientation, his information resources tend to be physical resources such as the text book, which provides concrete examples.

> I like to get the textbook and I just flick through that too, and the textbook is very, very readable. And it's full of interesting pictures and it's up to date and it just, it's stimulating just to look at. (Ben)

This comment reinforces the concrete nature of the textbook which appeals to his sensing perception. He also appreciates the unit outline as a resource, as this provides the structure, timetable and details of assignment work his judging orientation needs.

> The course outline, I always read that. As soon as that arrives I spend time reading that and just looking at dates and looking at an overview of what the topics are going to be. I find that a great way to study. Just to know what's coming up. … And then I like to look at what the assignments are. And I like to plan because I like to probably get about 15 articles off the net from various places that relate to the topic that I know I'm going to [do], so I've just got them laying around the bedhead, and when you can't sleep I can pull them out and look at them.(Ben)

Here he indicates the need to plan ahead that those with judging orientation need to do. His interest impetus to learn encourages the exploration of material, but with his low level of self-perceived technology ability and his sensing perception, he prefers to print the articles accessed from the Internet rather than using them online or in electronic downloaded form on a computer. The articles he refers to are from particular electronic databases he has been directed to, thus reducing the load on the technical skills required in searching online. He sees these databases as an extension of the library, reducing the need for him to be skilled at authenticating online material.

When we look at his use of communication elements, he tends to restrict his communication to face-to-face conversations with those he already knows well (i.e. family and friends) rather than his peers, which fits with his low level of self-perceived technology ability and his introverted personality. This is also reflected in this comment regarding his interaction with peers at the residential.

> Most people I talk to here [the residential] are all nice people. … I tend not to get too involved. I see the point of making a whole heap of friends is not going to do me any favours in what I'm here to achieve. (Ben)

As an introvert, he is comfortable learning alone, thus not connecting for learning purposes with his peers, even in this face-to-face environment. Needless to say, he had no contact with students online, where the low level of self-perceived technology ability has a greater impact.

> I had the impression that people who started off in first year here were actually better prepared, more prepared to do all that forum and that and communicate with each other and discuss ideas and all that kind of thing. But to be honest I didn't know how to do it, because I came in at second year, the beginning of second year and so maybe they taught themselves or they were taught something at the beginning that I didn't catch onto. And I don't need it. (Ben)

Here we see that the lack of access to training, coupled with his low self-perceived technology ability and his introverted nature, impacted further on his willingness and inclination to use the asynchronous forum.

In summary, by examining the elements that a learner has included in his/her environment, those that he/she has rejected, and the reasons behind those choices, an insight is gained into what might determine the inclusion of an element into the provided environment and the way in which it is likely to be viewed, and subsequently used or discarded, by the learner. Therefore, each component to be included in the provided

learning environment needs careful consideration in terms of its relevance to the drivers that impact on the learner's construction and use of their learning environment, with clear reasons given for that element's inclusion, its linkage with other components within the unit, and adequate training and support in its use.

7.4 Conclusion

What has been illustrated and discussed here in this chapter in relation to the learner's construction and use of his/her learning environment parallels a constructivist approach to learning. As in the construction of new, individual representations of knowledge, each learner forms new, individual representations of his/her own learning environment, determined by the drivers that impact on this construction and use: namely the impetus to learn, the self-perceived level of technology ability and the personality type of the learner. But, as with the social constructivist approach to learning, this construction and use of the learner's learning environment is not done in isolation. The drivers behind the construction and use of the learner's learning environment interact with the nature of the provided learning environment, causing the acceptance or rejection of elements of that provided environment, dependent upon the nature of the pedagogy/design of the provided environment and the match with the learner's particular drivers. When the pedagogy/design of the provided environment matches the learner's drivers, the provided environment is incorporated into the learner's own environment. When there is a conflict between the pedagogy/design of the provided environment and the learner's drivers, the learner will reject the elements provided. In some cases the learner will utilize other resources of their own to substitute for the rejected elements, including additional elements to further enrich their learning environment. In other cases they will operate with a considerably reduced learning environment. If the learner's learning environment differs markedly from the provided environment, particularly if no new elements are substituted for the rejected ones, then the educator's intended learning outcomes may be compromised, which ultimately impacts on the learning outcome for the learner. The majority of existing research in the field of learning environments focuses on what the educator does or designs as implications for learning (Conole et al., 2004; Information Resources Management Association, 2011; Lockyer, Bennett, Agostinho, & Harper, 2009). This discussion shows that there is a potentially new way

of considering learning environments: that is, from the learner perspective, where the three drivers identified here impact on the construction and use of the learner's learning environment and ultimately the learning outcomes for the learner.

8 Chapter Eight – Conclusion

8.1 Introduction

This chapter summarizes the main findings of the research completed for this thesis. It then goes on to describe the significance of the research and the theoretical and practical contributions this research makes in relation to research into learning environments, outlining future research directions based on this study. It concludes by suggesting that the learner's construction and use of his/her learning environment, and the drivers that impact on this construction and use, are an important part of constructivism, and that this, in turn, informs the development of provided learning environments by educators/designers to support the attainment of learning outcomes.

8.2 Main findings

The conduct of this research study has been guided by the following two research questions:

1. What are the needs and characteristics of the learner, and the influences (both internal and external) on the learner that impact on the construction and use of his/her learning environment?
2. How do these needs, characteristics and influences impact on the learner's learning environment in terms of its construction and use?

The research described and discussed in this thesis is focused on the learner's learning environment from the perspective of the learner. Just as constructivism holds that, in the process of learning, a learner constructs his/her own representation of knowledge, so this study has found that a learner constructs his/her own learning environment to support that learning. The research also found that each learner forms his/her own unique environment. The learner creates this unique environment by commencing with the elements from the learning environment provided with the unit, using some elements and discarding others, which are then combined with additional elements from outside the provided environment.

8.2.1 The three drivers that impact on the construction and use of the learner's learning environment

The study identified three drivers that have an impact on this construction and use of the learner's own unique learning environment – namely 1) the learner's impetus to learn; 2) the learner's self-perceived technology ability; and 3) the learner's personality type as assessed through the Myers Briggs Type Indicator®. The findings for each driver are outlined below.

8.2.1.1 Impetus to learn

The driver identified as the learner's impetus to learn refers to the reasons behind the learner's engagement with the unit under study. Six sub-categories were identified as part of this driver.

- Career – this impetus to learn reflects a focus on career, either where the learner is already working in an area closely associated with his/her career and is studying to further that career, or is using the study to move into a career in a more formalized way. The focus for the environment is on augmenting their learning environment with additional resources and connections from career and work.
- Interest – this impetus to learn reflects a particular interest in the topic area, either from general interest or from personal experience with the topic area. The focus for the environment is on further exploration of the topic areas of interest by augmenting their learning environment with extra resources and networks to satisfy this.
- Assessment – this impetus to learn reflects a focus on the assessment items of the unit under study, their requirements and the resources and processes needed to complete them. The focus for the environment is on using what is provided that will aid in the completion of assessable items, with additional elements added to their environment where needed to complete this assessable work.
- High achievement - this impetus to learn reflects a focus on achieving the highest possible mark for the unit. The focus for the environment is making use of the provided environment and additional resources and networks that the

learner is comfortable with, which will aid in understanding the content and concepts of the unit to achieve the highest possible grade.

- Pass achievement – this impetus to learn reflects a focus on completing enough assessable work to achieve a pass grade in the unit of study. The emphasis is less on understanding in order to complete the assessable work, but more on meeting enough of the requirements to pass. The focus for the environment is using mainly those elements from the provided environment to complete work to a pass level. Additional elements will only be used if essential for the completion of the assessable work, and communication is used to ensure the learner is "on track" to complete the work.
- Unfocused – this impetus to learn is where the learner has no specific impetus for studying the unit. These units are often compulsory units or are undertaken because of convenience. The environment set up is dictated by the provided environment of the unit and the resources and communication needed for set tasks, assessable or otherwise, the learner is directed to complete.

The study also found that, when time constraints or other intervening factors impact on learning and study, the primary impetus to learn is relegated to a secondary role. When this occurs, the environment constructed reflects the nature of the primary impetus, but its use is restricted to the narrower focus of the completion of required work.

8.2.1.2 Self-perceived technology ability

With the advent of greater levels of technology – particularly of an online nature – being used in tertiary education, the second driver identified as having an impact on the construction and use of the learner's learning environment is that of self-perceived technology ability. This relates to the learner's own perception of their ability, which may be different to their actual competence level. Five levels of self-perceived ability were examined – low, low-to-medium, medium, medium-to-high and high. Each of these levels was discussed in light of the following:

- The learner's attitude to the technology in terms of its value, relevance and use. It was found that the lower the level of self-perceived technology ability, the

lower the value attached to the technology and hence the less relevant or useful it was seen to be.

- The World Wide Web was more likely to be considered as a resource for those learners with higher levels of self-perceived technology ability, with those with lower levels of self-perceived technology ability less likely to trust the authenticity of the information provided through the Web.

- There was little difference when considering print versus electronic materials for reading, with all levels of self-perceived technology ability preferring print; however, those with higher levels of self-perceived technology ability were more discerning in what electronic material they selected for printing.

- Development of written material was more likely to be done directly on computer by those that had higher levels of self-perceived technology ability. Those learners with lower levels of self-perceived technology ability tended to work with hard-copy first.

- Computer-mediated communication was less likely to be used by those with lower levels of self-perceived technology ability, with their sense of disconnectedness to others online matching their lack of use of CMC.

- Privacy concerns online were an issue for all learners, however those with higher levels of self-perceived technology ability used alternate online communication forms, while those with lower levels of self-perceived ability avoided using the online media.

- Integration of the virtual and physical environments was minimal, if at all, for those with the lowest levels of self-perceived technology ability, gradually increasing to a full integration for those with the highest levels of self-perceived technology ability.

8.2.1.3 Personality type

With personality type being closely aligned with learning style, this study found that the four main dimensions of the MBTI have an impact on the construction and use of the learner's learning environment as follows.

- Focus of energy: Extraversion (E)/Introversion (I)
    - Those with a preference for extraversion incorporate elements into their learning environment that focus on interaction with others, with a preference for face-to-face communication.
    - Those with a preference for introversion are more likely to be independent learners, preferring to work alone, and so incorporate information resources and reference material into their learning environments rather than people networks.

- Perceiving of information: Intuition (N)/Sensing (S)
    - Those with a preference for intuitive perception will use resources such as study guides and text books to gain an overview of the unit, adding tools such as mind maps that can help develop this global conceptual framework. Resources will also be used to provide linkages across topic areas and within broader theoretical settings, with communication used to explore possibilities and ideas.
    - Those with a preference for sensing perception will use resources to provide detailed information and will add activities and resources that have practical application and provide concrete examples. Communication is used to share and collect knowledge and information, with these learners preferring forms that enable them to use their senses (e.g. face-to-face or phone).

- Decision-making: Thinking (T)/Feeling (F)
    - Those with thinking judgment use resources to aid their understanding, utilizing communication to come to conclusions about their learning.

Networks with others are utilized only when it can further their understanding or provide information.

  - Those with feeling judgment rely on their subjective decision-making to determine which elements of the environment to employ, utilizing those that "feel right" to them. They focus on relationship and so have networks with others (both peers and teachers) as part of their learning environment.

- Orientation shown to the outer world: Judging (J)/Perceiving (P)
  - Those with a judging preference have a very structured learning environment, incorporating any provided structure into that environment. They will utilize plans for assessment completion, and their physical environment will be uncluttered and organized.
  - Those with a perceiving preference will incorporate a large number of information resources into their learning environment. They will rely on others for information requirements and times for assessable work. Their physical environment often appears disorganized, with materials liberally spread about.

8.2.2 The combinatory effects of the three drivers

The study also explored the combinatory effect of the three drivers on the learner's environment. It was found that the impetus to learn and the personality type of a learner have an additive combinatory effect on the learning environment, with the self-perceived technology ability tempering the effects of the other two drivers, causing less utilization of technology for those with lower levels of self-perceived technology ability and greater use of technology for those with higher levels of self-perceived technology ability. These combinations gave rise to 240 potentially different environments. Given that there are other factors besides the three drivers that would also impact on this construction and use of the learner's learning environment, it is reasonable to conclude that each learner's environment is unique.

8.2.3 The relationship of the drivers to the pedagogy, design and elements of the provided environment

Because the learner's learning environment is potentially unique, the thesis has considered these drivers in light of their impact on, and relationship to, the pedagogy and design of the provided environment and the elements chosen for inclusion in that provided environment. This investigation provides important information for educators and designers of learning environments for university courses, as it shows that the provided environment may not be used by the learner as the educator/designer intended, which may in turn impact on the learning outcomes for the learner.

It was found that pedagogical approaches engender particular types of learning environments, and that those learners whose drivers match well with the provided learning environment will engage fully with the unit, while those whose drivers match poorly with the provided learning environment may disconnect with the unit or be required to make considerable efforts to create an environment that enables them to achieve the learning outcomes set for the unit.

In relation to design of the provided environment, it was found that learners react differently to aspects of design depending on the nature of the design and how well the drivers of the learner match with this design. This suggested that by incorporating a range of elements and ways of using those elements into the design of aspects of the environment, there would be a greater likelihood that those aspects of the provided environment would be integrated into the construction of the learner's own learning environment to facilitate his/her learning.

For specific elements of the provided environment, it was found that particular elements were either included or rejected as part of the construction and use of the learner's own learning environment, with the drivers providing an insight into the reasons behind these choices.

8.3 Significance of the findings

As outlined in the introduction, the changing nature of tertiary education has demanded an approach to learning that is both life-long and learner-centered, which extends not only to learning but to the learning environment needed to support that learning. Too often research into learning environments has focused on the educator and/or designer perspective of the provided learning environment, with little consideration of the learner in the construction of that provided learning environment. Constructivist principles of learning are often stated in the approach to the construction of the environment, while forgetting that the learner needs to construct his/her own understanding and knowledge, and so will need to construct a learning environment that supports this learning construction (see Section 8.4 for more detail). Research into the use of the provided environment has focused on usage outcomes of the provided environment by the learner (see Section 2.5 in chapter two of this thesis), often with little or no consideration of why the learner has used that environment in the way he/she has, or what the learner has required in addition to the provided environment.

This study provides an insight into the drivers behind the learners' choices, not only of the elements of the provided environment, but also those elements they add to the construction and use of their own learning environment in order to support their learning. This is important because it assists researchers and educators to understand the drivers, individually and in combination, that inform the idea that each learner's learning environment is uniquely constructed, and how these learner-constructed learning environments interact with what they, as educators, are providing to support the learning in their units of study. In this sense, learner "constructivism" means being more aware of how **the learner's drivers will intersect with the selected pedagogy and/or the particular design of a given unit of study, particularly where multiple technologies are used by the educator/designer to support the learning process**. This has implications for higher education because educators and designers cannot assume that what they envisage in their approach or design will be how the learners experience that environment and, as a consequence, "construct" their learning.

Taking Goodyear's (2002) educational design problem space (p. 65, Figure 4.3) as shown in Figure 1 of this thesis, it is therefore possible to develop a new schema that includes the learner and those drivers as an integral part of educational design (see Figure 10 below).

When educators and designers now create an environment, they can include not only aspects of community, place and activity into the design, but recognition of the impact of the learner and what drives the construction and use of the learner's own environment. This recognition of the learner as part of the educational design problem space will raise the awareness of the educator/designer as to what is incorporated by learners from the provided environment, whether they use it as intended or not, and what additional elements they require in their learning environment. Ultimately, understanding the learner constructed environment has implications for the extent to which the learning outcomes for the unit are likely to be realized.

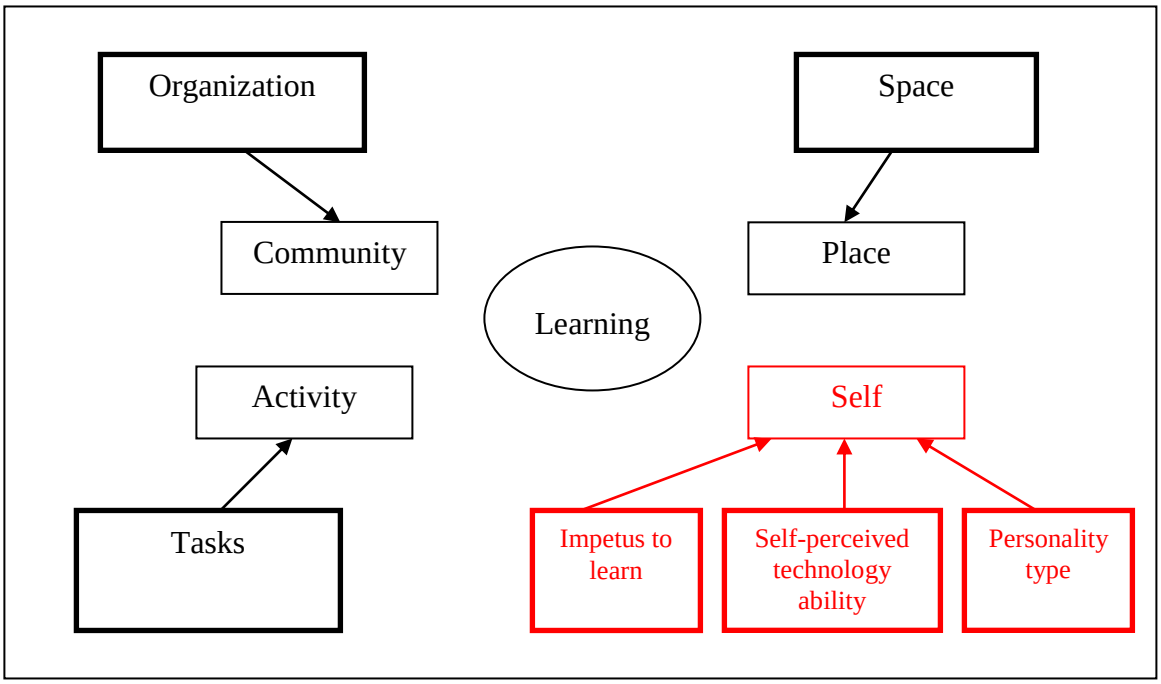


Figure 10: The modified educational design problem-space (addition to diagram in red)

8.4 Theoretical contributions

The theoretical framework underpinning this research is that of constructivism. As has already been shown in chapters 1 and 2, constructivist approaches to teaching and learning underpin many of the pedagogical approaches and environment designs used today, particularly when those environments incorporate computers and online technology. This study extends our understanding of constructivism, recognizing that constructivism includes not only the individual and social construction of knowledge and understanding by the learner, but also **individual and social construction by the learner of a learning environment that supports that learning.** This idea is not necessarily entirely new. Von Glasersfeld (1996) recognized this when he said:

> constructivist orientation can modify a teacher's attitude. It could, for instance, bring home the realization that students perceive their environment in ways that may be very different from those intended by the educators. And this environment includes curricula, textbooks, didactic props including computer programs and microworlds, tasks they are given, and, of course, the teachers. This emphasizes the teacher's need to construct a hypothetical model of the particular conceptual worlds of the students they are facing. One can hope to induce changes in their ways of thinking only if one has some inkling as to the domains of experience, the concepts, and the conceptual relations the students posses at the moment (pp. 6-7).

This idea of the environment being an integral part of constructivism appears to have been lost in the focus on learning, particularly where Higher Education institutions are using online or digital learning environments. **This study makes an important contribution to the body of literature on learning environments by reconnecting constructivism with the learner through the learner's construction of his/her environment, identifying three of the main drivers that impact on this construction and use.** If educators and/or designers are able to consider these findings, they may better be able to construct the hypothetical model von Glasersfeld refers to, and, in

practical ways, provide a supportive learning environment that more closely aligns with the learner's own learning environment. This will have the effect of enabling greater engagement in the unit of study and the successful acquisition of the learning outcomes for that unit.

8.5 Practical contributions - implications for the development and use of the provided environment

The study has implications for the development and use of the provided learning environment of a unit of study at university. These are outlined as follows:

- The identification of a learner's drivers would enable the educator to gain an insight into the learner's reaction to the provided environment. This could help determine why certain pedagogical approaches and/or designs are either successful or unsuccessful, and why elements of the provided environment are adopted by some learners but not by others. It may also lead the educator to consider that the issue of lack of achievement of learning outcomes may not be due to a lack of understanding, but may be due to issues with the learning environment.

- The design of an environment, no matter how flexible or comprehensive, is unlikely to be able to meet the needs of all learners, therefore some assessment of the cohort of learners in terms of their drivers would enable a design to be employed that would suit most learners. It would also raise the educator's awareness of those learners who are unlikely to engage with the provided environment, enabling extra support and assistance to be provided for those learners when needed.

- Inclusion of particular elements as part of the provided environment can be considered in light of their relevance to the learners' drivers, thus enabling the educator/designer to give a clear indication of why particular elements have been included, which could, in turn, help encourage the learner to include those elements in his/her own learning environment.

- This study helps raise awareness of the potential bias of a particular pedagogical approach towards a particular impetus to learn or a particular personality type. Recognition of this bias will help in highlighting potential problems for learners whose impetus to learn or personality type does not match the bias inherent in the pedagogical approach. It will also aid in the choice of elements of the environment and their intended use, enabling the inclusion of elements that support a greater range of sub-categories of these two drivers. This is particularly important for the inclusion of technology elements, as the level of self-perceived technology ability of the learner has an added impact on the inclusion of such an element into the learner's own environment, particularly if the level is low.

- Facilities for the provision of training in the use of technology, and hence the ability to raise the self-perceived technology ability of the student, need to reflect the diversity of the learner and the different drivers that are employed when constructing and using a learning environment.

8.6 Future research

This study has identified three drivers that are important factors in the construction and use of a learner's learning environment. Future research into other factors could be conducted to determine if there are any that may have significant impact on this construction and use. Some of the factors that might be considered are secondary impetuses to learn, clarity of preference of functions of the MBTI, the combinatory effects of the functions of the MBTI (i.e. complete personality types rather than just the main functions), gender, age, culture, time constraints for the learner and other intervening factors for the learner such as illness or family commitments.

As indicated in Section 3.10, there were some limitations of this study in terms of the technology considered as part of the learner's environment. Future research into investigating other technologies such as wikis, blogs, other social media (e.g. Facebook, Twitter) and technology resources such as Google docs, RSS feeds and podcasts, could

provide a valuable insight into the use of these technologies in relation to the drivers already identified. This was not possible in the current thesis, as these technologies that are now more frequently used had not emerged fully into the technological landscape of learning environments at the time of the data collection.

8.7 Summary

This chapter has outlined the main findings of this research, in particular the identification of three drivers that impact on the construction and use of the learner's learning environment, and the nature of that impact. These findings are important because of the contribution they make to the theory of constructivism in education. This contribution occurs in two ways: 1) by acknowledging the construction of the learning environment as part of constructivist theory; and 2) by reconnecting the learner element to constructivism in higher education learning environments, particularly in light of a learner-centered approach to learning that is supported by online and computer technology. This research provides a significant avenue for future investigation into the field of the learner's learning environment, particularly as new technologies continue to develop and higher education institutions increasingly adopt Web 2.0 and mobile technologies, and adapt social media for learning purposes.

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Appendix A Ethics Clearance

Appendix A-1 Ethics clearance from Monash University

MONASH UNIVERSITY

28 August 2003

Standing Committee on Ethics in Research Involving Humans

Dr Bernard Holkner
Department of Education
Clayton Campus

Ainslie Ellis
16 Helene Court
Boronia Victoria 3155

2003/579 - Investigation of student online learning spaces

The above project was approved by the Standing Committee on Ethics in Research Involving Humans at meeting B7/2003 on 26 August 2003.

Approval of this research project is subject to receipt of letters of permission or letters of approval from other HRECs from institutions and organisations at which you are conducting your research. Please provide these letters to SCERH as soon as possible.

Terms of approval

1. This project is approved for three years from the date of this letter and this approval is only valid whilst you hold a position at Monash University.
2. It is the responsibility of the Chief Investigator to ensure that all information that is pending (such as permission letters from organisations) is forwarded to SCERH. Research cannot begin at any organisation until SCERH receives a letter of permission from that organisation. You will then receive a letter from SCERH confirming that we have received a letter from each organisation.
3. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval and to ensure the project is conducted as approved by SCERH.
4. You should notify SCERH immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
5. The Explanatory Statement must be on Monash University letterhead and the Monash University complaints clause must contain your project number.
6. **Amendments to the approved project:** Changes to any aspect of the project require the submission of a Request for Amendment form to SCERH and must not begin without written approval from SCERH. Substantial variations may require a new application.
7. **Future correspondence:** Please quote the project number and project title above in any further correspondence.
8. **Annual reports:** Continued approval of this project is dependent on the submission of an Annual Report. Please provide the Committee with an Annual Report determined by the date of your letter of approval.
9. **Final report:** A Final Report should be provided at the conclusion of the project. SCERH should be notified if the project is discontinued before the expected date of completion.
10. **Monitoring:** Projects may be subject to an audit or any other form of monitoring by SCERH at any time.
11. **Retention and storage of data:** The Chief Investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.

All forms can be accessed at our website www.monash.edu.au/resgrant/human-ethics

We wish you well with your research.

[redacted]

Dr Andrea Lines
Human Ethics Officer

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Appendix A-2 Ethics clearance from University of Ballarat

University of Ballarat
Human Research Ethics Committee (HREC)

HUMAN RESEARCH ETHICS APPROVAL FORM

Principal Investigator / Supervisor: Dr Bernard Holkner

Associate Researcher/s: P Ling/A Ellis

Student Researcher/s:

School: Department of Education, Monash University

Ethics approval has been granted for the following project:

Project Number: 03/117

Project Title: Investigation of student online learning spaces

for the period: 15/09/2003 to 31/12/2006

Meeting No: 6/03 **Meeting Date:** 21/08/2003

Within one month of the conclusion of the project, researchers are required to complete a Final Report Form and submit it to the HREC Executive Officer.

If the project continues for more than one year, researchers are required to complete an Annual Progress Report Form and submit it to the HREC Executive Officer within one month of the anniversary date of the ethics approval.

Signed:.....[redacted]..... Date: 03/09/03.....
[Executive Officer, HREC]

Appendix A-3 Ethics clearance from Charles Sturt University

Subject: RE: The rest of the ethics information.
From: "Covic, Tanya" [redacted]
Date: Mon, 16 Aug 2004 15:02:13 +1000
To: Ainslie Ellis [redacted]

Ainslie,
I've checked with the School's committee and was told that you don't need to apply to them, your university's approval is enough. So all under control, and just up to students if they'll want to participate.
Cheers,
Tanya

Dr Tanya Covic, MAPS
Lecturer in Psychology
Course Coordinator Graduate Diploma of Psychology
Charles Sturt University
School of Social Sciences and Liberal Studies
Panorama Ave, Bathurst NSW 2795 Australia
Phone: [redacted]
Fax: [redacted]
Email: [redacted]

-----Original Message-----
From: Ainslie Ellis [mailto: [redacted]
Sent: Friday, 13 August 2004 11:58 AM
To: Covic, Tanya
Subject: The rest of the ethics information.

Here it is
Ainslie

Ainslie Ellis
Director FLITE Centre, FIT
HEDU Associate, FIT
Phone: [redacted]
Mobile: [redacted]
Monash Provider Number: 00008C

Music is food for the soul, it gladdens the heart and lightens the work
---

Appendix B – Explanatory Statement

(to be retained by participant)

MONASH University

Date: June , 2006

Project Title: Investigation of the Student's Online Learning Environment

My name is Ainslie Ellis and I am doing research under the supervision of Dr. Bernard Holkner, a senior lecturer in the Faculty of Education at Monash University and Dr. Peter Ling, the Director of the Academic Development and Support Centre at Swinburne University of technology. The research is being undertaken for my PhD in Education at Monash University.

The purpose of this research is to investigate the nature of the student online learning environment. When confronted with taking a course online, a student has to construct his / her own learning environment and learning strategies that incorporate activity (tasks and resources), community (interaction, social and cultural influences) and place (the online course environment) and that takes into account the student's personality and learning styles. This study investigates the nature of the constructed student online learning environment to determine what patterns and constructions occur and their relationship with a student's own preferred learning styles and personality type.

It is hoped that this research will be valuable in informing the design of online courses and in helping students become aware of how they might best learn within the online environment.

I am looking for students enrolled in this unit who are willing to participate in the study in the following way:

- Complete the Myers-Briggs Type Indicator self-report questionnaire
- Participate in an audiotaped interview about your learning strategies and use of the online learning environment (e.g. use of online communication, use of resources provided, choices within learning, study approaches and learning strategies, reasons for doing the unit, views of collaborative learning)
- Allow transcripts of their online discussion for the unit to be accessed by the researcher

The amount of time required will be approximately one hour for the completion and debrief of the questionnaire and a further one hour for the interview.

The questionnaire takes this amount of time as there is a debrief associated with this questionnaire that will provide you with information about your personality type, and how it differs from other types. It is hoped that this information will be personally useful

to you in relation to your study and approach to learning, as well as informing the research I am undertaking.

Please note that your participation in this research is voluntary, and there will be no penalty to you if you choose not to participate in this research. The information you provide will be held in the strictest confidence and will be stored appropriately in secure storage. It will be retained for a period of five years after the research has been completed, after which time it will be destroyed.

You may withdraw from the study at any time by informing me via email ([redacted]) or by informing the lecturer of the unit who will pass this information on. You do not need to give a reason, and, in this case, any information you have supplied regarding the study will be destroyed and withdrawal will have no impact on your results in your course.

No individual will be able to be identified in any publications that use this data (e.g. PhD thesis, journal and conference articles).

If you have any queries or would like to be informed of the aggregate research findings, please contact:

Ainslie Ellis: telephone [redacted]
email: [redacted]

You can complain about the study if you don't like something about it. To complain about the study, you need to phone 9905 2052. You can then ask to speak to the secretary of the Human Ethics Committee and tell him or her that the number of the project is 2003/579. You could also write to the secretary.
That person's address is:

The Secretary
The Standing Committee on Ethics in Research Involving Humans
PO Box No 3A
Monash University
Victoria 3800
Telephone +61 3 9905 2052 Fax +61 3 9905 1420
Email: SCERH@adm.monash.edu.au

Thank you.

Ainslie Ellis

Phone: [redacted]

Appendix C – Informed Consent Form

Informed Consent Form

Project Title: Investigation of the Student's Online Learning Environment

I agree to take part in the above Monash University research project. I have had the project explained to me, and I have read the Explanatory Statement, which I keep for my records. I understand that agreeing to take part means that I am willing to:

- Complete the Myers-Briggs Type Indicator self-report questionnaire
- Be interviewed by the researcher
- Allow the interview to be audiotaped
- Make myself available for a further interview should that be required
- Allow transcripts of the online discussion for the unit to be accessed by the researcher

I understand that any information I provide is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party.

I understand that, at my request, I will be given a transcript of data concerning me for my approval before it is included in the write up of the research.

I also understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalized or disadvantaged in any way.

Please tick **one** of the following:

- ❑ The information I provide can be used in further research projects which have ethics approval as long as my name and contact information is removed before it is given to them
- ❑ The information I provide cannot be used by other researchers without asking me first
- ❑ The information I provide cannot be used except for this project

Name: ..... (please print)

Signature: ..... Date: .....

Appendix D – Combinatory Effects of the Three Drivers

This appendix shows, as an example, the combinatory affects on the construction of the learner's learning environment of the Career impetus to learn when combined with the level of self-perceived technology ability and personality type (as determined from the MBTI®). It provides a general description of the combining of these drivers, together with the a summary of the information in table format.

General description of the combinatory effects

For those learners with a career impetus to learn, information resources such as text and lectures will be used as foundation resources, with other resources provided by the unit fully utilized. These learners will also add other resources not provided by the unit from their own work environment.

Those with intuitive perception will look for resources that focus on theory and concepts and the linkages between them, while those with sensing perception will focus more on information resources that provide facts and knowledge and the provision of concrete examples. These resources are more likely to be hard copy resources, such as library books and printed articles, for those with low self-perceived technology ability, with an increase in the inclusion of electronic resources as the self-perceived technology ability increases. Those with the highest level of self-perceived technology ability are likely to make much greater use of electronic resources, both from the Web and electronic databases, and will access these as their primary, if not their only, information resources. For those with low levels of self-perceived technology ability, any electronic resources that they do use are likely to be printed in their entirety, often while accessing them online. As the self-perceived level of technology ability increases, resources are more likely to be downloaded and then culled before printing, even being used solely in electronic form by those with the highest level of self-perceived technology ability.

These learners with a career impetus to learn will also add people from their work environment or those associated with their careers as an information resource to their learning environment. Extraverts will often have quite extensive networks of people,

while introverts will have smaller networks, relying more on information resources as they are more individualistic learners than their extraverted counterparts. This communication with their network of people is more likely to be face-to-face, particularly for extraverts.

For communication with those within the unit, the learners with low self-perceived technology ability will use little or no CMC, which will gradually increase as the self-perceived technology ability increases, moving through passive use of asynchronous online forums to more active use of these forums, as well as a greater use of email. The level of connectedness online will also increase as the self-perceived technology ability increases, although this level of connectedness is impacted by aspects of personality. Extraverts will find a greater connectedness through face-to-face connection and hence will prefer to use this form of communication even when the self-perceived technology ability is quite high. Those with sensing perception will prefer the nuance of the physical aspects of non-verbal communication present in face-to-face communication and are also more likely to prefer face-to-face communication, and those with feeling judgment may lose a sense of connectedness with others online.

For those with intuitive perception, communication will be used primarily for sharing ideas and discussing theories and concepts, while for those with sensing perception the emphasis will be more on sharing information and examples, particularly from their work environment. Those with thinking judgment will use communication to enhance their understanding, while those with feeling judgment will use this to connect with other and gain mutual support. They will, particularly, provide support of other learners through sharing their work experiences.

These learners with a career impetus to learn will have limited connection with the lecturer, whom they will use minimally for assistance. What connection is made will include a personal connection for those with feeling judgment, while those with thinking judgment will base the connection on the information provided by the lecturer. When that assistance is required, those with lower self-perceived technology ability will make

contact via face-to-face or phone, with a gradual increase in the use of email as the self-perceived technology ability increases.

The physical and virtual environments will be quite separate for those with low self-perceived technology ability, with an increased level of integration as the self-perceived technology ability increases, resulting in a fluid movement between the two environments for those with the highest level of self-perceived technology ability. Extraverts will place a greater emphasis on the physical environment, keeping that face-to-face connection with others in their work environment. Those with a judging preference will have order and structure to their environments, whether virtual or physical, while those with a perceiving preference will be more spontaneous.

The following tables (Tables A4-1 – A4-8) provide a summary of the combinatory effects of the driver career impetus to learn when combined with self-perceived technology ability and personality type.

Summary tables showing the combinatory effects of the drivers

Table A4-1: Career impetus to learn, self-perceived technology ability and extraversion

	Information resources	**Communication**	**Connection with lecturer**	**Physical/virtual environment**
General features	Text and lectures used as foundation resources. Extra resources from work environment, including people as an information resource and activities that involve people.	Prefers face-to-face communication. Networks formed include work related colleagues from outside the university – people network can be quite extensive.	No specific connection with lecturer, who is used minimally for assistance.	Physical environment important
Low self-perceived technology ability	Little or no use of technology. Information resources tend to be hard copy sources. Electronic resources usually printed directly from online source	Little or no use of CMC (passive use only of asynchronous forum if used at all). Minimal if any connectedness to others in the online communication environment.	Face-to-face preferred. May use phone or email as a secondary preference, but will endeavour to make contact face-to-face.	Physical and virtual environments quite separate.
Low to medium self-perceived technology ability	Minimal use of technological resources. Electronic resources usually printed directly from online source.	Will use email only if face-to-face not available. Tend to be passive participants in asynchronous online forums. Low connectedness to others online.	Face-to-face preferred and will use email only if face-to-face not available.	Physical and virtual environments quite separate.
Medium self-perceived technology ability	Greater use of technological resources. Web-based information used for overviews and general information. Downloads and prints electronic resources rather than using online.	Greater use of email. Tend to be passive participants in asynchronous online forums. Connectedness online OK if the connection is established in the face-to-face environment first.	Greater use of email but still prefers face-to-face.	Some integration of the two environments
Medium to high self-perceived technology ability	Incorporates technology-based resources, but still uses print resources. Will download and cull before printing.	Uses email as an alternative to face-to-face. More active in forums. Still some disconnect with others online, but less effect on participation.	Email used more extensively but still prefers face-to-face.	Greater integration of physical and virtual environments. Computer an important part.
High self-perceived technology ability	Technical resources integral to learning, first port of call for information. May not print out electronic resources – will download and cull if they do print.	CMC incorporated well into environment, including synchronous online media. Active participant in forums – may have face-to-face follow-up with those met online.	Uses email as much as face-to-face.	Environments well integrated with the computer often central, but will still have a reliance on the physical environment.

Table A4-2: Career impetus to learn, self-perceived technology ability and introversion

	Information resources	**Communication**	**Connection with lecturer**	**Physical/virtual environment**
General features	Text and lectures used as foundation resources. Uses work information resources. Resources tend to be reference material and information resources rather than people. Resources tend to be individualistic.	Prefers communication in small group or one-to-one face-to-face communication. Includes work colleagues outside university.	No specific connection with lecturer, who is used minimally for assistance. Less communication with lecturer than extraverts.	Physical environment only more important to those with lower levels of self-perceived technology ability.
Low self-perceived technology ability	Resources mainly printed medium – books texts, printed reading lists. Electronic resources usually printed directly from online source.	Minimal communication – will use face-to-face when needed. Will use email if face-to-face not available but used minimally. Has difficulty connecting with others online.	Communication minimal. Sometimes seen as bothering the lecturer.	Environments quite separate. Will use virtual environment when required by the unit for assessment or when it is recommended.
Low to medium self-perceived technology ability	Minimal use of technical resources – barriers seen as searching efficiency and authenticity checks. Printed medium used almost exclusively – prints online materials.	Greater use of email, but still prefers face-to-face. Passive participant in asynchronous online forums. Minimal connectedness to others online.	Will use face-to-face contact first to connect with lecturer when needed. Uses email only if face-to-face not available	Environments quite separate. Will use virtual environment when required by the unit for assessment or when it is recommended.
Medium self-perceived technology ability	Greater use of technological resources – web used for overview purposes only. Will download electronic articles and print. Uses work resources – mix of print and electronic.	Greater use of email. Mainly passive use of asynchronous online discussion. Less impacted online by the need for face-to-face connection with others, but will note comments posted from those already known. Some face-to-face connections with work colleagues.	Greater use of email, but still prefers face-to-face contact to connect with lecturer when needed.	Some integration but still physical environment more important.
Medium to high self-perceived technology ability	Greater use of electronic information resources. Web used as a reference. Downloads and culls before printing electronic material but still prints. Still uses work resources but to a lesser extent as electronic resources become available.	Will use online resources more – email and a more active participant in asynchronous online discussion. Doesn't necessarily need face-to-face connectedness first to connect online. Still has face-to-face work connections.	Email use equally with face-to-face contact to connect with lecturer, but only if needed.	Some integration, with computer now playing a more important role.
High self-perceived technology ability	Prefers lectures to be available electronically for download. Technological resources, university and work, integral to learning and used in preference to print resources. Downloads and culls before printing, and some may not even print.	Uses email and active asynchronous online communication in preference to face-to-face. Synchronous online communication used but still prefers face-to-face one-on-one and small group discussion. Some face-to-face communication with work colleagues.	Still minimal contact, but email now used just as much, if not more, than face-to-face. Will look at asynchronous forums also for assistance.	Fluid movement between physical and virtual environments. Computer central and often the starting point for learning. Some may use the virtual environment as the sole environment.

Table A4-3: Career impetus to learn, self-perceived technology ability and intuition

	Information resources	**Communication**	**Connection with lecturer**	**Physical / virtual environment**
General features	Uses study guides, text and lectures to get a global overview. Resources are used to provide theory and linkages. Extra resources gained from the work environment. Will make use of mind maps.	Uses communication to explore possibilities and share ideas. Communication networks of people related to career and work environment.	No particular connection – used minimally for assistance.	
Low self-perceived technology ability	Information resources tends to be hard copy resources. Tends to use only recommended online resources, and will print these out directly from the online environment.	Minimal if any use of CMC. Little or no connectedness to others online.	Preference is for face-to-face if at all.	Environments quite separate.
Low to medium self-perceived technology ability	Some use of technological resources but limited use. Will print directly from online resources. Face-to-face or paper-based activities.	Prefers face-to-face communication. Passive participation in asynchronous online forums. Will use email if no face-to-face is available. Low connectedness to others online.	Preferably face-to-face, but will use email if face-to-face not available.	Environments quite separate.
Medium self-perceived technology ability	Greater inclusion of technological resources, including using the web to provide overviews. Will download electronic resources and print.	Still prefers face-to-face for discussion, but will use email and asynchronous online forums. Still fairly passive in asynchronous online forums. Some sense of connectedness online if face-to-face connection has already been made.	May use email as well as face-to-face.	Some integration of the two environments.
Medium to high self-perceived technology ability	Accesses internet and electronic journals for more detail. Still uses work resources but to a lesser extent as electronic resources that are work related become more prevalent. Will download and cull before printing.	More active participation in asynchronous online forums and will post if connected with the ideas. Greater use of CMC by those with introverted intuition rather than extraverted intuition.	Greater use of email.	Environments more integrated with computer becoming more central.
High self-perceived technology ability	High use of electronic material, including web resources. Will download and cull before printing and may not print out electronic material at all.	CMC now part of the environment for discussion and sharing of ideas. Active participation when they connect with the ideas being discussed and when they can provide links to other information. Will still use face-to-face for discussion, especially those with extraverted intuition.	Greater use of email.	Fluid movement between physical and virtual environments, with computer central and often the starting point for learning, developing an overview/outline then adding more detail. Some may use the virtual environment as the sole environment.

Table A4-4: Career impetus to learn, self-perceived technology ability and sensing perception

	Information resources	**Communication**	**Connection with lecturer**	**Physical / virtual environment**
General features	Uses text and lectures to get facts and information. Uses resources to provide more detail and find concrete examples.	Communication used to collect information and share knowledge. Will have networks outside the university with work colleagues or those who can provide information related to career.	No particular connection – used minimally for assistance.	Physical environment is important.
Low self-perceived technology ability	Mainly paper based resources including work resources.	Prefers face-to-face with little or no use of CMC.	Preferably face-to-face if at all.	Environments quite separate.
Low to medium self-perceived technology ability	Some use of technological resources but limited use. Will print from online resources. Face-to-face or paper-based activities.	Still a preference for face-to-face or phone that allows nuance to be collected through the senses. Passive participant, if at all, in asynchronous environment.	Preferably face-to-face, but will use phone or email if face-to-face not available.	Environments quite separate.
Medium self-perceived technology ability	Greater inclusion of technological resources as general information resource but may get overwhelmed with detail from poor searching techniques. Will download electronic resources first before printing. May look for non-text based resources that provide sensory input.	Still prefers face-to-face but has some connectedness online if a face-to-face connection has already been made.	Will use face-to-face, phone and email.	Some integration of the two environments.
Medium to high self-perceived technology ability	Much greater inclusion of technological resources. Will use web references formally. Will download and cull before printing electronic resources.	Active participation in asynchronous communication when they have information to share.	Greater use of email.	Environments more integrated with computer becoming more central.
High self-perceived technology ability	Will download and cull before printing electronic resources. May not print at all.	Some use of synchronous chat. Level of connectedness doesn't impact participation.	Greater use of email.	Fluid movement between physical and virtual environments, with computer central and often the starting point for learning, writing down information.

Table A4-5: Career impetus to learn, self-perceived technology ability and thinking judgment

	Information resources	**Communication**	**Connection with lecturer**	**Physical / virtual environment**
General features	Use resources that aid understanding.	Used to come to conclusions about their learning.	Made through the objective information that is provided and is used for minimal assistance.	
Low self-perceived technology ability	Web Not used as an information resource. Prefers print – everything printed. Tends to print from online copy.	Prefers face-to-face. Little or no use of CMC. Passive participants in asynchronous forum. No use of synchronous medium. Low or no connectedness to others. Discussion forums too public.	Assistance rarely sought, but prefers face-to-face.	Quite separate. Only see linkages when it is provided.
Low to medium self-perceived technology ability	Mainly paper based. Will use electronic journals if provided. Searching and authentication barrier to using the web. Prefers print – everything printed. Tends to print from online copy.	Uses email only if face-to-face not available. Passive participation in asynchronous discussion. Low connectedness to others. Discussion forums too public.	Preferably face-to-face, but will use email if face-to-face not available.	Quite separate.
Medium self-perceived technology ability	Web used for overviews but not specific references. Downloads first then prints.	Greater use of email. Prefers face-to-face for discussion – mainly passive participation in asynchronous discussion. Connectedness to others when face-to-face relationship is present.	May use email as well as face-to-face.	Some integration of the two environments.
Medium to high self-perceived technology ability	Web used as formal reference material. Will use technology comfortably. Will cull in electronic form before printing.	More active participation in asynchronous discussion. Level of connectedness doesn't impact participation. Privacy issues resolved by using email.	Greater use of email to connect with lecturer.	Environments more integrated with computer becoming more central.
High self-perceived technology ability	Technology based resources often first port of call. Used in preference to hard-copy sources. Will cull in electronic form before printing. May not print at all.	Incorporated CMC into environment – high use of email, active participation in asynchronous discussion, some use of synchronous chat. Level of connectedness doesn't impact participation. Privacy issue resolved by using email.	Email used as much as face-to-face.	Fluid movement between physical and virtual environments, with computer central and often the starting point for learning and writing down information.

Table A4-6: Career impetus to learn, self-perceived technology ability and feeling judgment

	Information resources	**Communication**	**Connection with lecturer**	**Physical / virtual environment**
General features	Use resources that "feel" right.	Used for support and to check their conclusions with others. May lose the sense of connection with others in the online asynchronous discussion environment. Feeling combined with sensing needs physical connection in communication.	Made through a personal relationship. Used minimally for assistance.	
Low self-perceived technology ability	Web Not used as an information resource. Prefers print – everything printed. Tends to print from online copy.	Prefers face-to-face. Little or no use of CMC – considered too public. Passive participants in asynchronous forum. No use of synchronous medium. Low or no connectedness to others.	Assistance rarely sought, but prefers face-to-face.	Quite separate. Only see linkage when they are provided.
Low to medium self-perceived technology ability	Mainly paper based. Will use electronic journals if provided. Searching and authentication barrier to using the web. Prefers print – everything printed. Tends to print from online copy.	Uses email only if face-to-face not available. Passive participation in asynchronous discussion. Low connectedness to others. Discussion forums too public.	Preferably face-to-face, but will use email if face-to-face not available.	Quite separate.
Medium self-perceived technology ability	Use resources that "feel" right. Web used for overviews but not specific references. Downloads first then prints.	Greater use of email. Prefer face-to-face for discussion – mainly passive participation in asynchronous discussion. Connectedness to others when face-to-face relationship is present.	May use email as well as face-to-face.	Some integration of the two environments.
Medium to high self-perceived technology ability	Use resources that "feel" right Web used as formal reference material. Will use technology comfortably. Will cull in electronic form before printing.	More active participation in asynchronous discussion. Level of connectedness doesn't impact participation. Privacy issues resolved by using email.	Greater use of email to connect with lecturer, but only if needed.	Environments more integrated with computer becoming more central.
High self-perceived technology ability	Use resources that "feel" right. Technology based resources often first port of call. Used in preference to hard-copy sources. Will cull in electronic form before printing. May not print at all.	Used for support and to check their conclusions with others. May lose the connection with others in the online asynchronous discussion environment. Incorporated CMC into environment – high use of email, active participation in asynchronous discussion, some use of synchronous chat. Level of connectedness doesn't impact participation. Privacy issue resolved by using email.	Greater use of email.	Fluid movement between physical and virtual environments, with computer central and often the starting point for learning, writing down information

Table A4-7: Career impetus to learn, self-perceived technology ability and judging preference

	Information resources	**Communication**	**Connection with lecturer**	**Physical / virtual environment**
General features	Uses texts and lectures as foundation resources. Uses study guide and timetables to provide structure. Uses systems, processes and up-front plans. Adds additional resources from work environment.	Used to come to conclusions about their learning. Forms networks with work colleagues outside university.		Physical environment uncluttered and organized.
Low self-perceived technology ability	Mainly hard copy resources. Web not used as an information resource. Prefers print – everything printed. Tends to print from online copy.	Prefers face-to-face. Little or no use of CMC. Passive participants in asynchronous forum. No use of synchronous medium. Low or no connectedness to others. Discussion forums too public.	Used for minimal assistance – preferably face-to-face if at all.	Quite separate. Only see linkages when it is provided.
Low to medium self-perceived technology ability	Mainly paper based. Will use electronic journals if provided. Searching and authentication barrier to using the web. Prefers print – everything printed. Tends to print from online copy.	Uses email only if face-to-face not available. Passive participation in asynchronous discussion. Low connectedness to others. Discussion forums too public.	Used for minimal assistance – preferably face-to-face, but will use email if face-to-face not available.	Quite separate.
Medium self-perceived technology ability	Web used for overviews but not specific references. Downloads first then prints.	Greater use of email. Prefer face-to-face for discussion – mainly passive participation in asynchronous discussion. Feels connected to others online when face-to-face relationship has already been established.	Accessed when needed for assistance – may use email as well as face-to-face.	Some integration of the two environments.
Medium to high self-perceived technology ability	Web used as formal reference material. Will use technology comfortably. Will cull in electronic form before printing.	More active participation in asynchronous discussion. Level of connectedness doesn't impact on participation. Privacy issues resolved by using email.	Greater use of email to connect with lecturer, but only if needed.	Environments more integrated with computer becoming more central.
High self-perceived technology ability	Technology based resources often first port of call. Used in preference to hard-copy sources. Will cull in electronic form before printing. May not print at all.	Incorporated CMC into environment – high use of email, active participation in asynchronous discussion, some use of synchronous chat. Level of connectedness doesn't impact on participation. Privacy issue resolved by using email.	Email used as much as face-to-face.	Fluid movement between physical and virtual environments, with computer central and often the starting point for learning, writing down information.

Table A4-8: Career impetus to learn, self-perceived technology ability and perceiving preference

	Information resources	**Communication**	**Connection with lecturer**	**Physical / virtual environment**
General features	Will tend to collect large amounts of information	Relies on others to keep them "on track". Has networks with work colleagues outside university.	Lecturer only accessed as needed for assistance. Usually minimal.	May be disorganized.
Low self-perceived technology ability	Web not used as an information resource. Prefers print – everything printed. Tends to print from online copy.	Prefers face-to-face. Little or no use of CMC. Passive participants in asynchronous forum. No use of synchronous medium. Low or no connectedness to others. Discussion forums too public.	Preferably face-to-face if at all.	Quite separate. Only see linkages when it is provided.
Low to medium self-perceived technology ability	Mainly paper based. Will use electronic journals if provided. Searching and authentication barrier to using the web. Prefers print – everything printed. Tends to print from online copy.	Uses email only if face-to-face not available. Passive participation in asynchronous discussion. Low connectedness to others. Discussion forums too public.	Preferably face-to-face, but will use email if face-to-face not available.	Quite separate.
Medium self-perceived technology ability	Web used for overviews but not specific references. Downloads first then prints.	Greater use of email. Prefer face-to-face for discussion – mainly passive participation in asynchronous discussion. Connectedness to others when face-to-face relationship is present.	May use email as well as face-to-face.	Some integration of the two environments.
Medium to high self-perceived technology ability	Web used as formal reference material. Will use technology comfortably. Will cull in electronic form before printing.	More active participation in asynchronous discussion. Level of connectedness doesn't impact participation. Privacy issues resolved by using email.	Greater use of email to connect with lecturer, but only if needed.	Environments more integrated with computer becoming more central.
High self-perceived technology ability	Technology based resources often first port of call. Used in preference to hard-copy sources. Will cull in electronic form before printing. May not print at all.	Incorporated CMC into environment – high use of email, active participation in asynchronous discussion, some use of synchronous chat. Level of connectedness doesn't impact participation. Privacy issue resolved by using email.	Email used as much as face-to-face.	Fluid movement between physical and virtual environments, with computer central and often the starting point for learning, writing down information..