Learning at the Screenface:
A pentadic analysis of email discussion lists

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Abstract

Online learning (‘e-learning’) is a ‘hot topic’ (EdNA, 2004) within Australian higher education, yet remains under-researched and, therefore, not fully understood. Existing research consistently associates low levels of student engagement with online learning modes with, although not limited to, changes required in students’ learning behaviour and that of their instructors. Responding to both sets of findings, this thesis focuses on understanding the pedagogic properties and potentials of online learning within higher education to guide both the practice of and deliberations about this hot topic.

Sociocultural theories of learning provide a conceptual framework for studying both individual and social levels of human practice and relations between them (Kuutti, 1996, Lewis, 1997, Wertsch, 1998), such as those afforded by online learning arrangements. This thesis uses these theories, which posit the individual in a social framework, to assist in addressing questions about “what is involved, when we say what people are doing and why they are doing it?” (Burke, 1969). Burke proposes a framework, the Pentad, which is a valuable methodological tool for understanding and illuminating online learning environments. Using Burke’s framework, it is proposed that these environments mediate learning through a complex relationship among five factors: the act of interacting (i.e. act), the person interacting (i.e. agent), the purpose for the interaction (i.e. purpose), the context in which the interaction takes place (i.e. agency) and the location of the interaction (i.e. scene). While the mediation afforded by online learning environments allows interaction between agents (e.g. students and teachers), a greater emphasis on interactions, such as those between peers and between novices and experts, arises. This thesis examines forms of interaction in the context of email discussion lists. The research questions addressed here are:

- What are the pedagogic properties of email discussion lists that influence students’ learning in electronically mediated environments?

- What new understandings of pedagogic processes can be gained from using “different angles of analysis” (Rogoff, 1990 p26) and a holistic analysis of email discussion lists such as provided by Burke’s (1969) Pentadic schema?

Both qualitative and quantitative methods are deployed in a case study of one university’s provision of online learning. Demographics of the student population are
combined with content analysis of online conversations and reinforced by responses from students to a survey. These are drawn from four email discussion lists.

The findings lead to the identification of key pedagogic principles for organising online learning. Like Lave and Wenger (1991), this research questions “what kinds of social engagements provide the proper context for learning to take place” (Hanks, 1991 p14). It is proposed that for the learners, negotiating an online learning environment through the use of email discussion lists requires understanding their own ways of learning. The instructors in these online environments can shape the learning outcomes through framing activities both before and during the course of study. Thus, the influence of agents, both learners and instructors, is highlighted. This accounts for and emphasises adults’ abilities and need to act agentically in facilitating their learning. Further, the research confirms that participation in an email discussion list is predictive of learning knowledge assessable through courses and substantiates the view that email discussion lists are helpful equivalents to distance learning, because they facilitate ‘anywhere/anytime’ interactions. Thus, the principle of engagement for different purposes at different times stands, but is extended to include individuals’ agency. The findings suggest reconceptualising Vygotsky’s (1978) Zone of Proximal Development into the Zone of Learning Capability, a more personally agentic view and promote Burke’s Pentad as being useful for analysing learning environments.

In summary, the thesis identifies and elaborates a means by which the pedagogic properties and potentials of online learning can be elucidated, and proposes practices for both learners and instructors as means of enacting an effective online pedagogy. In doing so conceptual premises of interaction between the individual and social contributions to learning have been extended.
This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.
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1. Online Learning

1.1 Online learning initiatives

Interactions among learners and between learners and teachers are an important part of online learning environments. Given that these interactions occur through computer mediation via text, which mediates both learning and the interaction among and between peers, with lecturers and the artefacts that comprise the online learning environment, they constitute important pedagogic practices. The online learning environment represents a form of learning-related interaction now being widely adopted by educational institutions. Yet its dialogical, and hence pedagogic, properties remain poorly understood and “fail to adequately address the broader learning needs of the university community” (Baskin, Barker and Woods, 2003, p192). This is because its “pedagogical benefits” rely extensively on how well it allows dialogue between participants (Laurillard, 2002, p148).

The principal argument in this dissertation is that current initiatives in online learning may fall short of the effective pedagogic practices required for learning in an online environment, because they are not organised and enacted effectively. Many initiatives focus on technological solutions to pedagogic problems by providing standard interfaces – Learning Management Systems such as Blackboard, and processes (Kuriloff, 2001). These interfaces are based on inter-networked communities utilising processes, which have been tested in other types of communities and for other purposes. However, changes in communication processes and pedagogic properties brought about by electronic networking may not be fully accounted for, resulting in some mismatches between educational processes and the underlying technologies.

In essence, how online learning environments mediate interactions among agents (students and teachers) remains to be fully explored. As advanced within this dissertation, this exploration is necessary because the mediation of interactions is shaped by the context of the interaction, as well as the person or persons engaged within that context. Underlying this premise are questions of what these people are doing, how they are doing it and their purpose for doing it, that is, their activities, processes and intentions. These aspects are not always considered or fully understood within an online environment. As the uptake of the use of online learning arrangements increases...
in pace and scope within educational institutions, so too does the urgency for an effective set of pedagogic practices suited to their purposes and processes.

Individuals’ learning is a complex, multi-layered, multiform activity (Watkins, 1996). There exist a number of ways of facilitating that learning, including the traditional didactic lecture or direct face-to-face teaching interaction. There are many critiques of the didactic style of presentation of information, because it positions the learners as being passive recipients of knowledge. However, when defining a learning environment as an interactional forum, which permits and encourages the co-construction of knowledge, the traditional lecture stands apart as being potentially non-interactional. Current understandings of learning, particularly those evolving from Vygotsky (1978), place a greater emphasis on interpersonal interaction, such as those between peers and between novices (e.g. students) and more expert partners (e.g. teachers) in the activities that are generative of extending individuals’ knowledge. It follows that interactional forms of learning environments are becoming popular and are highlighted by moves to the organisation, administration and enactment of assisting learning through electronic technology, particularly electronically mediated distance learning for geographically isolated students. Early forms of distance learning included the ‘correspondence model’ (Taylor and Swannell, 1997) parallel the lecture/tutorial form of campus-based learning interactions with their presentation of information in packages and activities corresponding to various parts of the curriculum. Inventions of various technologies, for instance audio and video recordings and the telephone lead to different kinds of interactions that, in some ways, became distinct from didactic face-to-face teaching. These constituted the first three generations of distance learning (correspondence, multimedia and telelearning). According to Taylor and Swannell (1997: online), the current use of the Internet in supporting and directing learning represents the fourth generation of distance learning – the flexible learning model which is defined as combining the “benefits of high quality interactive multimedia, with access to an increasingly extensive range of teaching-learning resources and enhanced interactivity through computer mediated communication”. Beginning with so-called ‘telelearning’ and following through to the flexible model, interaction between individuals became a central concern of educators when determining how to develop courses and assist learners. Yet the widespread use of the Internet has resulted in changes to the interactions that are now quite remote from the didactic approach to
supporting students’ learning face-to-face, and has thereby introduced new pedagogic practices and possibilities.

**1.2 How the Internet became central to education**

Perhaps the most significant change in the provision of Australian higher education in recent years has been the integration of the Internet and related technologies into the teaching-learning process. These technologies have had a significant impact on how education is implemented (Jefferies and Hussain, 1998). The high rate of uptake and ownership of personal computers, the relatively low (and decreasing) cost of obtaining the technology and the short period in which they have been available have resulted in radical, sudden changes (Hilton, 1999). To elaborate on this impact, the following sections discuss some key features of these changes, which are now significantly influencing contemporary educational practices. In particular, this discussion highlights how rapidly these changes have occurred and been incorporated into education practice.

In 1982, the protocol, Transmission Control Protocol over Internet Protocol – TCP/IP which allows different computers to communicate, and on which the Internet is based, was developed (Howe, 1993). In 1984, the total number of nodes (i.e. individual servers which act in a similar way to telephone exchanges) on the newly forming Internet numbered around 1000 (Hardy, 1993). Today, this is less than the number of individuals who are often involved in a single email discussion list hosted on a single node of the Internet. In the same year, William Gibson coined the term ‘cyberspace’ in his novel *Neuromancer* (Gibson, 1984). This word now pervades our language when speaking of the Internet.

In 1989, the first commercial electronic mail carriers (MCI Mail and Compuserve) appeared on the Internet. Also in 1989, Australia joined the National Science Foundation Network (NSFNET) after having established a permanent email link with the United States of America (USA). In 1992, database searches were still being performed via dial-up calls to the USA. These searches are now performed routinely by individuals around the globe, using a computer connected to the Internet.

Over the last 15 years, there has been phenomenal growth in the use of internet technologies. One of these technologies, electronic mail (email), has probably had the most far-reaching consequences for students and the ways in which their learning is
supported. The introduction of the LISTSERV application in 1986 (Hardy, 1993) and the release of Majordomo software in 1992 (Chapman, 1992) allowed a single individual to send a message to multiple recipients. By 1995, many universities were providing students with university email addresses, thereby ensuring that all students had access to email. With such universal provision, email became a part of the repertoire of technologies available to support student learning, culminating in an almost ubiquitous provision of online learning environments in one form or another. Thus, according to Nunan (1996 online)

New ground rules for education are being created by the convergence of low-cost, high-speed computing, high-band-width/low-cost telecommunications and high-capacity low-cost mass-storage that transform both information flow and personal communications.

These technological changes were paralleled by changes in the cost of computers that allow ownership by most people. The rate of ownership among students and the general public is increasing each year. Table 1.1 shows the increasing level of ownership of computers and access to the Internet in Australian households for the past five years. The number of households with computers is approximately two thirds, while the over 16 years of age population with Internet access in any location (for instance, home, work and elsewhere) is higher, having reached three quarters of the population. These levels of ownership and access are among the highest in the world (National Office for the Information Economy (NOIE), 2002), and indicate a level of acceptance within Australia of the Internet which provides the basis for online learning support to become mainstream.

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<td>People 16+ with Internet access who used Internet</td>
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Table 1.1 Computer and Internet Access in Australia (Source (1) (NOIE, 2000) (2) (NOIE, 2001), (3) (NOIE, 2002) (4) (NOIE, 2003))

According to NOIE’s data, males and females have access to the Internet in nearly the same proportion of the population, while slightly less than three quarters of those
with access actually having used it. In the period covered by Table 1.1, the difference between the proportion of males and females accessing the Internet has decreased as both have taken up the opportunities provided. Based on this data, females, however, have made up more ground and are now on a par with males in terms of Internet usage. This research was undertaken during the rapid rise of the general population, but particularly females gaining access to the Internet. This is important because these rapid changes in use reflect the uptake of these technologies within tertiary education (Hassan, 2001).

This short history introduces the basis for contextualising the use of the Internet in education, particularly in Australia. In other words, the advent of the Internet in Australia within the last 20 years has rapidly reshaped the options for communicating, teaching and learning and where these can occur. However, it is less clear whether these options are being enacted in ways that best address the pedagogic properties of what is available. This is because these properties remain to be fully understood. As Scribner (1985 p138) proposed,

... hardly have we approached the problem of understanding the intellectual impact of the printing press than we are urged to confront the psychological implications of computerisation.

This dissertation seeks to contribute to this goal of confronting the impact and implications of computerisation on education, particularly through the use of Internet enabled learning, via the technology of email.

### 1.3 Online learning environments

According to Education Network Australia (EdNA, 2004) research into ‘e-learning’ (online learning) in higher education is a ‘hot topic’. Online learning environments are constituted by two very different aspects of learning management or support (Ruth, 2002b, Inglis, 1999). The first is concerned with the presentation of information for access by students – the electronic equivalent of the didactic form of the traditional lecture. The second is concerned with the provision of forums for students to interact and form collaborative and peer-based learning nodes – the electronic equivalent of the tutorial, workshop or laboratory session. The primary focus of the present research study is on the provision of forums for students to interact, that is the tutorial, peer-based part of a learning program within an online learning environment, implemented in
the form of email discussion lists. Because the technologies, which facilitate these forums, potentially impact on the ways individuals act within a learning environment, they have become a focus for inquiry. The value of the interactive part of any learning environment is generally premised upon constructivist notions in which students actively construct knowledge through interacting with both the material and their peers (Laurillard, 2002). The need to explore the processes that comprise these interactions is paramount, as the mediated environment becomes a central part of learning processes.

It is held here that the online learning environment mediates learning through a complex relationship among the act of interacting, the persons interacting, the purpose for the interaction, and the context in which the interaction takes place. This complex relationship has at least three forms: (i) presenting information or requesting information, which is associated, in an interactive environment, with the posting of a message – displaying knowledge or requesting information, and (ii) the reading of the message – processing information, actively constructing meaning and transferring existing meaning. A third form, which in effect is consonant with the first, is in replying to a message that has previously been posted and read, that is, the kinds of interactions that initial engagement promotes or constrains.

Thus in an online electronic forum these interactions are often intended to enable students to:

- generate and formulate a proposition or question (i.e. send a message to the class);
- formulate an understanding (i.e. read a message sent to a class list); and
- formulate a response or further question (i.e. respond to a message sent to a class list).

In simplified terms, a student interacts with a message (via an application) sent to a class in order to learn. In this way, the means of interaction (the computer/application) shape the action in essential ways. Learning becomes mediated through textual interaction at a time and in a space of their choice. Figure 1.1 represents this mediated interaction within the context of this research project using the Majordomo email list program.
The mediation of interacting in an online environment is via the ‘screenface’, alternatively called the computer desktop, or the ‘glass screen’ (Arnold, 2002), although this is not the complete basis for interaction. This screenface encompasses the desktop (i.e. the interface to the operating system, such as Microsoft Windows or Mac OS) and the glass screen, as well as more virtual layers in between, that is, the interfaces to computer programs. At times, the work done by a researcher, as a user of a computer, calls for an engagement at the screen and the desktop. The location of working is at the screenface, which includes the screen and the desktop as well as any other applications in use, for instance word processor, spreadsheet, statistical package and bibliographic software in particular, each of which can be customised. Each of these appears on the desktop but overlays it; appears between the desktop and the screen; appears at the screenface.

Figure 1.1 The Majordomo program with list recipients
To understand this concept further, it is important to first consider the traditional terms used in definitions of computers, that is, the ‘user’ and the ‘interface’. The term ‘user’ arises in information systems, where a ‘user’ is equated with a role in an organisation. The definition of ‘user’ is “any person, organisation, process, device, program, protocol, or system which uses a service provided by others” (Howe, 1993). For instance, users of a system such as Blackboard Academic Suite (Blackboard Inc., 2004) come in two forms or in two different roles. The teacher is one type of user who can add material, and manipulate data about students and courses. This kind of user can upload course content, interact with the class list, add students to the class list and so on. The interface for this type of user has specific settings for the role of ‘teacher’. The interface is “a program that controls a display for the user (usually on a computer monitor) and that allows the user to interact with the system [syn: user interface]” (Howe, 1993, italics added). Figure 1.2 represents the relationship between the screenface and the interfaces to applications.

The other type of user for the BlackBoard system is the student. This type of user can look up their courses, find their availability, and check their status in the course and potentially the state of any assessment. There is a distinct interface for this type of user that does not allow for activities restricted to the role of teacher. Thus the user’s role in the organisation dictates the interface. Conversely, the interface with which a user works at a particular time and/or place may dictate their role (compare with a library system which has different interfaces depending on the location of computers).
This is the general relationship between a user and the interface. They are mutually defined depending on context. In some environments, the interface becomes personalisable. Colour and layout can be tailored to individuals’ needs or preferences. There are other parameters that are also modifiable depending on the user’s ‘user status’. This further exemplifies the relationship between a user and the interface.

On a personal computer, the desktop pattern may be set to a particular image; the screensaver may be modified in terms of speed, colour and pattern and indeed an individual screensaver may be installed. The interface to the computer is the ‘desktop’. On top of this desktop, users place interfaces to other programs, for instance word processors, web browsers, spreadsheets and so on. Each appears between the ‘desktop’ and the screen. Many of these interfaces are modifiable within limited parameters.

Consider for a moment, a word processor. In it, we can elaborate ideas and process words that form those ideas. For some people, this is the extent of it. There is an acceptance of the way in which the word processor works that affects the outcomes of word processing. Consider further, the advanced word processing facilities now available, facilities such as grammar checkers, tracking changes and so on. These facilities afford particular ways of working. Part of that interface to the word process is modifiable, but is rarely modified. The standard setup for Microsoft Word in one of the preferences is that the identity of the user is ‘user’ (often changed to the company name). When inserting comments or changes, MS Word remembers that the comment or change was inserted by ‘user’. In effect, the word processor is appropriating the individual, subsuming their identity to that of ‘user’.

A similar appropriation occurs with both spelling and grammar. The default for ‘user’ in spelling is ‘US’ spelling. For an Australian, this can be annoying. To change this requires at least two changes in settings. After this, the interface is modified to that setting (provided it is set to ‘default’ rather than for a single document). Aspects of grammar are also modifiable. For instance, for a typist who learned to type in the 1970’s before the proliferation of word processors, the standard number of spaces at the end of a sentence is two. This is not the default in Word. However, it can be changed (and is the subject of much debate in the online world). If one space at the end of a sentence is accepted uncritically because that is what the word processor is defaulted to, then the word processor is appropriating the user. This means that the user is modifying their way of working to suit the tool. When the way of working for the ‘typist’ is two
spaces, this can be modified so that the computer becomes a tool being appropriated by the ‘typist’ rather than a tool which is in effect appropriating the ‘user’. Modifying the way of working simply because that is the default setting in some ways reduces the utility of the tool (the computer).

An individual’s relationship to a computer as an artefact is therefore variable, due to the ways in which each person individually works. For instance, whilst learning to word process, it may occur that one space becomes the default number of spaces at the end of a sentence, simply because a user learnt to word process rather than to type. However, for a typist who moves to a computer, the default has always been two, and to change that disrupts the natural flow of their process of typing. In appropriating the computer, the typist (an expert) may find the setting which allows the default of one to be changed to two, thus making the computer work for them rather than them working with a tool that requires that they modify their specific way of working. While one space may be a requirement for typesetting of documents as opposed to typewriting, the common practice still being taught in schools is two spaces.

However, in the sharing of electronic documents made possible with computers, the default may be set differently on some computers. For the individual whose default is set to one, and whose computer checks grammar, they end up with ‘green squiggles’ all over the text, which may disrupt their reading of the text. For the typist, whose work is being read by another, the request to change to a default of one space means that their way of working must be appropriated by the computer’s default, rather than their own way of working in which they have appropriated the computer. This kind of appropriation by a computer leads to postulating the computer, and indeed any ‘non-human’ artefact as an ‘actor’ in the network through “encoding more and more of the cognitive abilities attributed to humans into them” (Suchman, 1997, np). However, while a computer can influence actions, agents are able to advocate, accept or reject the use of any agency, particularly the computer.

This influence relates to Lave and Wenger’s (1991, p102) conception of the “transparency of mediating technologies”. Transparency refers to the way in which the mediating technology permits or disrupts the activity for which it is used. So for an individual using a computer, the screenface represents a boundary between the user and the use. In appropriating the computer, the screenface is becoming transparent.
The teleology of computer use is the screenface. A user is in a specific relationship with the screenface. This was particularly the case of this research as all data was collected electronically – student enrolments, archives and survey responses, leaving little evidence of the data. This was exacerbated by working with hard copy less and less, as notes from readings were available online as electronic files. Even editing is becoming less reliant on a hardcopy, although concerted reading of a text is often better accomplished via hardcopy. In effect, what this means is that for some individuals, their relationship to the screen is more important than other aspects of the learning/working environment. They are appropriating the computer as an essential part of their activities, that is, it is ‘transparent’ to the work they do. For other users, the screenface may represent a barrier to their use of a computer with all layers behind it being beyond their ability to access. The screenface, in essence, is opaque. The transparency of use of mediating technologies and their impact upon individuals’ mediated learning is a central conceptual contribution within this dissertation. Thus, the screenface becomes a boundary between the real environment and the virtual (online) environment, sometimes transparent, sometimes opaque. Potentially, the differences in the ways individuals exploit or reject mediating technologies influence the outcomes that are possible.

1.4 Previous Research into Online Learning Environments

A number of previous studies investigating participation in online environments (for example Althaus, 1997, Lund and Volet, 1998, Tarbin and Trevitt, 2001, Carrick-Simpson and Armatas, 2003) have shown low levels of student participation, which undermines simple assertions about engagement and interaction. One of the reasons for this, according to the research by Carrick-Simpson and Armatas (2003), is that designing for interactivity is not sufficient to engage students’ interest. Interestingly, students in Carrick-Simpson and Armatas’ research study chose to forego the marks awarded for the assessable online component. Therefore, simply establishing an online environment, and determining the rates at which students participate, may not provide sufficient understanding of the educational potential of interactions in an online environment because the variation in the ways that students participate is subsumed by a single measure. Brown and Johnson-Shull (2000) concur, stating that there is a mismatch between what we know and what we do in online forums. Sheard, Ramakrishnan, and Miller (2003) suggest that there is a major shift required in students’
learning behaviour for them to adopt the collaborative learning style characteristic of an electronic learning community. Similarly, Kreijns, Kirschner and Jochems (2003) warn against taking for granted that participants will interact socially simply because the environment provides an opportunity to do so. These studies suggest that simply providing an opportunity for students to interact is insufficient for the active use of the environment. Instead, students’ perceptions may be different from their teachers’, particularly as it seems students may choose to forego assessment that is based online. Perhaps not surprisingly, Bagherian and Thorngate (2000) found that offering a grade for postings has a much stronger effect on online participation than does encouragement from teachers. However, as noted by Oliver (2002), there are questions concerning the validity of mandating participation that include the kinds of engagement that occur and their consequences for learning outcomes. Nevertheless, computer-mediated discussion forums are becoming common in higher education (Guzdial and Turns, 2000), even though they are still only understood in a relatively limited way, for instance in terms of the motivations for students to engage in ways that lead to rich learning.

Valuable insights are now being gained into the understandings and perceptions of the participants (Thomas, Clift and Sugimoto, 1996; Soong, Chan, Chua and Loh, 2001) about students (Hammond, 2000, Kear, 2001, Thomas, 2002) and teachers (Mazzolini and Maddison, 2003). These include finding that status hierarchies exist between the postings of students and teachers, with many students placing more value on postings from teachers (Thomas et al., 1996). Status hierarchies negate the social co-construction of knowledge – the reciprocal process of interaction between people – because co-construction is generally theorised as between peers (Lawrence and Valsiner, 1993). The higher status placed on teacher postings means that there is a danger the learning environment might revert to a novice-expert interaction with little peer interaction, as in didactic face-to-face teaching. Soong, et al. (2001) found the technical competency of teachers and students, and the collaborative potential of the course to be critical factors for the uptake of electronic resources and interactions.

The lack of participants’ technical competencies may also interfere with the aims and purposes of the learning environments. The knowledge required to participate adds an extra layer of knowledge that needs to be gained before engaging in learning the knowledge offered through interaction. This is highlighted by Hammond’s (2000) findings that for many, particularly students, there is a high threshold of capability to
cross, that is, being able to utilise the computer and programs, before entering electronic discussions. In electronic environments, threaded discussions – those which maintain proximity of messages and responses – allow participants to follow conversations, which may facilitate the co-construction of knowledge, through the build-up of a pattern of information that contributes to understanding. For Kear (2001), the presentation of threading of discussion was found to have a significant effect on students’ use of a collaborative environment and on the character of the discussion. However, Thomas (2002) found that the typical non-linear branching structure of online discussion, that is, where individuals may follow different lines of engagement through multiple conversations originating from a single question, may not be sufficient for conversational modes of learning to be realised within an online discussion. Thus, the role of the teacher may be quite important in determining the nature of the discussion. Mazzolini and Maddison (2003) questioned the role of the teachers and whether they should be encouraged to take specific roles such as the prominent ‘sage on the stage’ role, the more socially equal constructivist ‘guide on the side’ role, or the ultra low profile role described as the ‘ghost in the wings’. They found that frequent posting by teachers did not increase student postings and that the lengths of discussions decreased the more teachers posted. However, the roles and outcomes of those roles for participants are not fully understood.

Other research has focused on students’ participation in online environments. Many studies (e.g. Cook, Leathwood and Oriogun, 2001, Gorand and Selwyn, 1999, Ho, 2000) have been undertaken to develop an understanding of the role of participation in online learning environments. Many of these studies, however, have resulted in a heuristic that participatory online learning environments should be limited in size and break down with large numbers of participants (greater than 50 according to Turoff, Hiltz, Bieber, Fjermestad and Rana, 1999). However, there is anecdotal evidence that online learning environments facilitate the teaching of large groups where students in diverse geographical locations can be “intellectually linked” (Brahler, Peterson and Johnson, 1999). This is clearly an area open to further research, because the current findings are inconclusive. The ability to facilitate learning of students in large cohorts exemplifies one of the potentials for online learning environments, namely cost saving for institutions and more broadly based access for the student. Thus, the focus of this research is on large enrolment courses (at least 100 students on the books – see Methodology section 3.4.1 for details of courses selected).
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So, current research suggests that providing opportunities to engage in online learning does not guarantee that students will participate or interact. The perceptions of individuals, both teachers and students, impact the likelihood of the environment being used in ways that go beyond what some teachers attempt by mandating participation. This is because the validity of simply mandating participation is questionable (Oliver 2002). This seems to sidestep the issue of understanding the roles participants may take, and how those roles influence learning through interaction.

1.5 Aim of research

It is proposed for effective online learning to occur that both student-teacher and student-student interactions must be fostered. These kinds of interactions take on a particular significance within groups of geographically distributed students, particularly members of large cohorts, such as in distance education within higher and tertiary education. Through understanding how learning is mediated online, a greater understanding of relationships and outcomes between humans and non-human artefacts may result.

The specific focus of this research is to analyse the ways in which asynchronous communication technologies in the form of e-mail discussion lists constitute and contribute to an interactive learning environment. Specific attention is given to the students and interactions, and to identifying evidence in email discussion lists that interaction facilitates learning-oriented processes. Currently, this evidence is lacking, despite widespread use of these discussion groups within higher education. Specifically, this research investigates how selected cohorts of students and tutors/lecturers use email and their perceptions of the usefulness of this technology in facilitating learning of course-related information.

This research is conceptualised within a framework that identifies both the computer and the Internet as a ‘tool’. Sociocultural theories of learning provide a conceptual framework for studying both individual and social levels of human practice and relations between them (Kuutti, 1996, Lewis, 1997, Wertsch, 1998). This framework permits a rich understanding of the relationship between the individual and the social, rather than one which excludes either human agency in the social or contextuality in the individual (Hung and Wong, 2000, Lewis, 1997). This means that sociocultural theory provides insights not available within single disciplines associated
with learning that focus on one or the other, as well as providing a framework for understanding participatory processes using multiple viewpoints. However, there are no prescribed processes for achieving this, which allow the use of relevant frameworks to assist in the understanding of processes being investigated.

There is a need for more holistic and extensive empirical studies into the use of communication technologies in education. The piecemeal approach of investigating a single aspect is the basis of many studies (e.g. how many students participate), which have identified the contribution of a particular aspect, such as participation rates (who is participating), participation processes (what they are doing) or student perceptions (what they think) (Ruth, 2002a). At most, previous studies have identified and investigated only two of these aspects.

The literature reviewed appears directed towards three goals for technology: (i) to conceive of ways of using it (advocate); (ii) to push forward the established uses (accept); or to (iii) highlight the problems inherent and thus justify its non-use (refuse). Heidegger (1977 p4) claims that “we shall never experience our relationship to the essence of technology so long as we merely conceive and push forward the technology, put up with it, or evade it”, (i.e. to critique it). At times, the relationship an individual has with technology may constitute finding new ways of using it, accepting or refusing its use. Recognising these three roles may permit an analysis of how the relationship to technology influences the use of technology in the wider sense. Recognising that a particular individual is promoting technological interventions in education permits the analysis to conceive of the impacts of this view of other individuals for whom the relationship is less conducive to ‘transparent’ use (Lave and Wenger, 1991, p102).

There seems, therefore, to be three roles taken on by teachers and by researchers towards the educational use of technology – advocate, acceptor, or refuser. But the role of questioner or critic, the role that Heidegger assumes, is often absent from current research on the use of technology in education. Hence, it is in questioning relationships between the means of mediating and how they influence the acts of learning, a greater understanding of the impact of technology on learning may be gained. These themes are combined with the conceptual framework introduced here and which will be discussed in depth in Chapter Two.

In order to investigate these relationships, this thesis is conceptualised within sociocultural theories, which posit the individual in a social framework and assist in
answering questions about ‘what is involved, when we say what people are doing and why they are doing it?’ (Burke, 1969, p xv), thus assisting in the role of ‘questioner’ advocated by Heidegger. Burke provides a framework, which uses five elements (the Pentad), – what is being done (act), who is doing it (agent), how they are doing it (agency), where they are doing it (scene) and why (purpose). Burke’s pentadic framework has been used extensively as a construct for viewing and analysing many communicative forms and events. For instance, Kahn-Egan (1997) used Burke’s Pentad to analyse the death by suicide of grunge icon Kurt Cobain, concluding that the scenic parameter of this act had been vastly underrepresented in previous analyses of this incident, that is, the influence of the ‘grunge’ scene and the expectations of people in that scene likely impacted on Cobain’s decision. Likewise, Freeman (1974, p10) used the Pentad for an analysis of the curriculum and the classroom and concluded that “Burke’s dramatistic metaphor offers a way of looking at the dynamics of human interaction … in the context of more sensitive and aesthetic perspectives”. The ‘dynamics of human interaction’ are central to the current investigation, particularly as they influence students in online learning environments.

The central ‘act’ that is of interest in this investigation is the participation in an online learning environment, specifically the interaction between participants, tutors and teachers (agents) facilitated by email discussion lists. The particular online learning environment that is the focus of this study is a ‘minimalist’ environment. The intended learning environment provided by the institution and teachers consists of the interaction medium (email discussion list) and material presented elsewhere, either in a face-to-face environment such as a lecture, or in a distance education environment with textual resources either physically sent to the student on paper or accessible via the World Wide Web. Combinations of participation are inherent in the wider educational environment as students not limited by distance may attend a class while students whose main enrolment is internal on-campus may also acquire the printed version of the material and/or access the material on the web.

This investigation aims to determine what new understandings result from stepping outside the roles of advocate, acceptor or refuser outlined above. Questioning the use of technology may lead to new ways of understanding online learning – its physicality, its potential and its role in the future of education. The relationships between Burke’s Pentadic elements (listed above and discussed in section 2.3) provide
insight into how online learning environments work for particular groups of students and for their teacher, and assist in the identification and establishment of pre-conditions which might need to be met for teaching online to result in learning online.

Further, an understanding of how individuals attempt to make sense of the requirements of participation is needed, as the purpose for utilising the online learning environment will likely differ between participants. A teacher’s purpose in utilising a discussion forum may be hidden from participating students or only marginally accessible by students. Moreover, the ‘top-down’ implementation of many online learning environments may require some teachers to modify their perception to a more positive stance, according to Cognitive Consistency (Festinger and Carlsmith, 1959) where the benefits to them may be less than adequate for the perception of a personally appropriate implementation. An analysis of information available to students, therefore, contributes to the ‘sense-making’ attempts by students. This stands as an important pedagogic concern.

In summary, the aims of this research can be succinctly stated in the following way. This research aims to

- Provide greater understanding of relationships between humans and non-human artefacts
- Understand the contribution of asynchronous communication technologies to learning
- Determine new understandings resulting from stepping outside the role of advocate, acceptor or refuser of technology
- Elaborate individuals’ attempts to make sense of requirements within online learning environments.

1.6 Conceptual significance

The findings of this inquiry lead to the identification of key pedagogic principles for organising online learning. Like Lave and Wenger (1991), this research questions “what kinds of social engagements provide the proper context for learning to take place” (Hanks, 1991 p14). The conceptual contributions aim to enhance the understanding of inter-psychological processes between humans and between humans.
and physical artefacts. Sociocultural theory assists in understanding relations between individuals and these activities, as well as the source of these activities, and which may be advanced by a rich analysis of these relations.

The research is focused specifically on the use of information and communication technologies for defined groups of students. As such, those individuals who choose not to participate are seen to be outside the terms of reference. Much research has been undertaken towards identifying and understanding the implications of the barriers to participation (see for instance Evans, 1995, Lund and Volet, 1998). This research focus on ‘barriers’ provides clear directions for determining the issues for the uptake of online learning opportunities. However, this focus does not provide an analysis of the learning opportunities provided by information and communication technologies per se, only for the students who were the subject of the investigation. Thus, this research/thesis focuses specifically on the participating individuals in order to determine how their learning is facilitated by their engagement with online learning, what forms that participation may take, and its consequences for their learning.

1.7 Thesis structure

The thesis comprises seven chapters. This first chapter highlighted the issues surrounding the introduction of text-based online environments and the resultant disruption to conventions of teaching brought about by the transfer of pedagogic processes to these environments. It then detailed the current research themes being engaged in with respect to tertiary education and to online learning environments in particular. Chapter Two advances this consideration of learning environments by reviewing and extending the conceptual framework employed to discuss learning systems in terms of motives. The identification of associations between aspects of online learning is initiated through discussions of previous research and the conceptual framework of sociocultural and literary theory. It concludes by proposing that the complexity of online environments may not be fully realised without attention to a comprehensive analytical frame that includes interactions between and among students and their teachers, albeit mediated electronically.

The research design and implementation, that is, the ways in which information was gathered and framed is advanced and justified in Chapter Three. The selected methodology of case study within the sociocultural theoretical framework is also
discussed and justified. The methods were selected to allow the analysis of three perspectives of the research: (i) the description of the population; (ii) content analysis of emails demonstrating the activities undertaken by students and members of the teaching team; and (iii) a survey of students.

Chapter Four provides a description of the 10 courses from which four were chosen for in-depth analysis, in order to provide an overview of the potential of discussion lists used as non-mandated elements of participatory environments. This description comprises a quantitative analysis of a number of variables related to course participation including patterns of subscription and participation.

Chapter Five elaborates the identification of relationships among act, scene, agent, agency and purpose, which are used to illuminate and analyse the online learning environments within the four courses selected in Chapter Four. This is achieved by focusing on the purpose of messages sent to lists and how these purposes influence how students engage in the environment using a computer (i.e. how agents act in the scene through agency). It is also informed by the perspective of students through responses to the survey and examples of the interactions taking place. The responses and interactions are used to highlight the tensions that are identified. In all, it proposes that the comprehensiveness of Burke’s (1969) Pentadic analysis is suitable for analysing online learning environments and provides a richer description of such environments.

Chapter Six synthesises the results from Chapters Four and Five and the conceptual framework from Chapter Two into a cogent whole. It advances how textually based environments work as a scene and how student participatory practices influence the learning environment. It proposes that human agency is important because it influences all other elements of the pentad. Discussions that reduce the significance of agency and scene may fail to fully appreciate the implications for the agent (students) of learning in a mediated environment. These elements are defining for the agent, whose sole contact with others may be through the screenface, the mediated environment. An appreciation of interactions, structured processes and Vygotsky’s Zone of Proximal Development are furthered.

Chapter Seven summarises the research, presents principal findings and outlines the implications of these findings for the use of technology in teaching and learning. It articulates the conceptual and procedural contributions of the research and details the contributions outlined in section 1.6 above.
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2. Learning, contexts and technology

First, that the problem of mutual intelligibility between humans and machines recommends a research agenda aimed less at the creation of interactive machines, than at the writing of dynamic artefacts intended to be legible, or intelligible to their users. This shift brings a rich set of resources from recent reconceptualizations of what writing and reading involve, including the inevitable uncertainties in relations of writer’s intentions to readers’ interpretations, and the active role of the reader in giving life and meaning to the text. And this approach encourages us to explore and articulate the particular dynamics of computational artefacts, and what new possibilities those dynamics afford. (Suchman, 1997, np)

2.1 Interactions in online learning

This chapter proposes that interactions between and among humans and between artefacts and humans are central features of mediated learning and that we need to explore and articulate the particular dynamics of our interactions with computational artefacts as proposed by Suchman (1997) above. Moreover, the effective mediation between individuals by electronic tools is essential to the process of appropriating socially constituted, but electronically mediated, instruction or online learning. Specifically, individuals are held to construct their own knowledge separately or as a part of social processes (Holman, Pavlica and Thorpe, 1997, Grossen, 2000). Online interaction potentially is held to mediate this construction by both enabling and constraining these processes. This chapter discusses the complex relationship among humans, learning, technology and content in an attempt to understand the pedagogic scope and potential of online learning environments. This requires specific attention be paid to both discussions of interaction between humans as mediated by electronic media and its relation to learning. This is applicable to those technologies that mediate between individuals in social processes of learning, which collectively constitute the means of mediating interaction.

Interpersonal interactions – those between individuals – take many forms, which can have quite different consequences depending upon their intensity, duration, purpose and degree of shared understanding. Each form of interaction may consist of negotiation between the individual and the social, that is, both the knowledge to be learnt and the social environment in which it is presented (Newman, Griffin and Cole, 1989). As an example, individuals learn through constructing knowledge and
contextualising it with their peers or in the location of learning. Internet-based learning interactions are supported by the presence and permanency of text, the visual and perceptual qualities of the computer screen and associated physical environment, and the capacity to use previous utterances in responses, where applicable (Russell and Cohen, 1997). However, the potential of these interactions can be weakened by the absence of many of the cues and clues that are inherent qualities of close interpersonal interactions, such as facial expression, linking modality of speech to utterances, and frequent opportunities for developing shared understanding through sharing and appraising utterances. It is through these kinds of face-to-face, interpersonal interactions that sociocultural views claim that intersubjectivity – shared understanding between participants – evolves most strongly (Rogoff, 1990, Wertsch, 1998). The value of proximity between a teacher and student is usually premised on the learner being able to understand what the teacher proposes, their point of view, thereby achieving intersubjectivity through a process of listening, making sense, raising questions and using responses to those questions to gain a greater shared understanding. Hence, from such a perspective, the degree by which internet-based interactions are able to foster intersubjectivity between what the teacher and learners is central to understanding its potential as a learning medium. Such an appraisal may open up consideration of how inter-psychological processes – those between individuals and social partners and artefacts (Vygotsky, 1978) – might be constructed in instances of human interactions and learning that are mediated by electronic technology.

Here it is held that these interactions are best understood through Burke's (1969) pentadic structures of act, scene, agent, agency, and purpose. These elements provide a framework for analysing the relationships between the act performed and the screenface, (i.e. the place where an individual performs their activity) and how they do it using electronic media. The interrelationships between the elements are essential in establishing how electronic media mediates knowledge for individuals both singly and as a group, and how that mediation influences their learning. This is because the complexity of this mediation requires the capacity to account for the activities learners engage in (act); the situation in which it occurs (scene); who is involved (agent); how the learner engages in these processes (agency) and the goals (purpose) that are sought to be achieved.
Defining learning is a complex issue with multiple perspectives and theoretical underpinnings. Most recently, constructivist principles have focused on the construction of knowledge by individuals, either solely or in groups. Constructivism has its roots in the work of Bruner (1966) and deals with four major aspects: (i) how individuals are predisposed to learning; (ii) how a body of knowledge can be structured for ready construction by learners; (iii) the effective sequencing of materials which provide access to knowledge construction opportunities; and (iv) the nature of incentives and penalties. Effective methods for structuring knowledge should result in simplification, the generation of new propositions, and an increase in the manipulation of information. This because these attributes are seen as being those possessed by individuals who demonstrate competence within a domain of activities (Ericsson and Lehmann, 1996). Jonassen’s (1998 online) version of constructivism views knowledge as “individually constructed and socially co-constructed by learners based on their interpretations of experiences in the world”. Co-construction refers to the reciprocal processes of interaction between two people, which shape the processes and outcomes of the constructive process (Lawrence and Valsiner, 1993). For instance, two individuals can discuss a concept, each adding their own insight, which may result in a shared definition of that concept. However, the co-construction interaction between humans mediated by non-human artefacts is less well understood. Objectivist notions, on the other hand, treat knowledge as an ‘object’ that can be transmitted and acquired by learners. While initially constructivist philosophy focused on the notion of the individual working with knowledge, some social constructivist positions also take the view that “cognition is a situated activity rooted in social practices” (Grossen, 2000 p21).

As an example of the espoused process of knowledge co-construction, teaching at tertiary level has been described as a conversation between the student and the teacher (Laurillard, 1993). Laurillard (1993 p84) describes a “principled approach to generating teaching strategy”, which incorporates a “continuing dialogue between teacher and student … [which] must reveal both participant’s conceptions [of topic content]” through interaction or conversation. Thus teaching is a social interaction, although teaching can occur without the intended learning occurring in those taught. Conversely, learning can occur without teaching. Neither activity guarantees, nor is guaranteed by, the other. This is because the individual and the social are engaged in a reciprocal process of knowledge construction (Rogoff, 1990, Kuutti, 1991).
relationship between teaching and learning is central to the constructivist view. However it also provides one of the problematics of definitions of teaching and learning as a conjoined activity. This is because there is a tendency to discuss the terms as distinct activities rather than two that are mutually entwined. As Grossen (2000 p30) states “learning and teaching are two complementary activities”. Structured learning environments may be more conducive to learning, when teaching is applied effectively, meaning that understanding the learning environment and its role in the reciprocal relations of students and teachers is essential. This distinction of ‘effective teaching and learning’ is becoming a mantra in educational circles (Ballantyne, Bain and Packer, 1999), providing for ways to ensure that any teaching done results in learning by students. The concept of shared understanding, or intersubjectivity, has long been used as a guide for education (Newman et al., 1989), that is, the student will come to share the knowledge of the teacher, although it is rarely fully achieved. It is held that through interactions (Newman et al., 1989) intersubjectivity is achieved over time. However the less visible, immediate and accessible forms of interaction that comprise communication in an electronically mediated environment may be less conducive to a high degree of intersubjectivity, because there are few opportunities to engage in interactions that work to clarify and monitor the response and behaviour of the participants in the interaction.

Hence, guidelines have been developed to assist in defining what leads to learning. For instance, Chickering and Ehrmann’s (1997) broad notion of pedagogy, as guidelines for how to teach, provides a foundation for how we perceive the learning environment, which is to provide a strong emphasis on the individual acting agentically in constructing meaning. However, this represents a particularly Western view of learning that may differ significantly from the approach adopted in Confucian heritage cultures as outlined by Biggs (1996). In those cultures, a preferred pedagogy is one by apparent transmission, although learners still engage actively with the knowledge to be learnt. The pedagogic framework employed, our conception of teaching and of learning, and indeed our cultural heritage, frame the learner’s actions within a particular environment as well as their perceptions of the teachers involved.

Previous research on this topic, from the Western perspective, has emphasised the individual, the social environment of a learning situation, and the reciprocity between these factors. For instance, Minsky and Marin (1999) focus on individual choice in
approaches to the constitutive act of learning. They focus on how individuals make ‘rational’ choices to use a particular technology, specifically email. Likewise, Roblyer (1999) examined student choice in deciding to take an Internet-based course. This focus for research places the individual student in the foreground of the constructivist process and illuminates a need to consider how students approach the learning environment, that is, what agency they display in making their choices.

Unlike the first approach, which focuses on the individual, the second approach is to understand the role of the social and physical environment in learning. As has been postulated, the setting or scene shapes the purposes, resources and interactions. For instance, Gay and Lentini (1995) undertook an exploratory study of a prototype networked environment using multiple channels (email, chat and video) for communication, which supported and augmented learning. This form of research investigates the effect of the learning environment on student learning. Newman, et al. (1989, p), on the other hand, emphasise the “social environment of instructional materials”, again placing the individual in the environment, but moving to an analysis of student interaction within the environment, particularly the instructional environment. There are research perspectives that examine the relationship between setting and learner – distributed cognition (Cole and Engeström, 1993), situated cognition (Nardi, 1996), activity systems (Holman et al., 1997) and anthropology (Lave and Wenger, 1991). These emphasise relations and interactions as bases for understanding environments in which humans learn and develop.

The two main approaches to research, discussed above, highlight that focus can be placed on both how the individual engages with the social world and the effect of the environment on learning. The approaches are not mutually exclusive, as they may privilege either or both the individual and the social working together. The interactions between the social and the individual are open to further scrutiny particularly in the context of higher education, because of the traditional independence of students in higher education and the less prescribed outcomes of these institutions. This dissertation takes a similar position to Newman et al. (1989), but emphasises the social environment of interaction rather than the social environment of instructional materials. It places the interaction in the foreground and investigates the ways that individuals interact within an environment. It takes as its central concern the interaction between
individuals, extends to how the computer mediates between the individuals and examines the reciprocity in the relations between the social and individual.

In summary, engaging individuals in a mediated environment is the central concern in understanding the online learning environment. The next section reviews the concepts used in discussing technologically mediated interaction in order to ascertain the importance of interaction for learning.

2.2 Environmental contributions to individual learning

Interaction within the physical and social environment is central to individual learning. The research on interaction in learning is extensive and includes many potential examples using descriptions of the situations in which it occurs. Inquiries originating in both formally defined situations, such as a ‘school class’ or in the ‘apprentice’ system in workplaces provide insight into processes that mediate the social construction of knowledge (Lave and Wenger, 1991). Similarly, classroom interaction, specifically socially situated cognition (Hatano and Inagaki, 1991, Resnick, 1991, Wertsch and Toma, 1995), is the basis for much of our understanding of the context of learning – that is, learning within a given situation which can be used to extrapolate to other situations. Each of these situations provides some insight into processes of learning because the dynamic of learning is flexible and shared. In particular, both the social and physical environments are held to actively mediate learning through co-locating individuals within a mutual physical space. For instance, early work by Vygotsky (1978) lead to understanding learning systems as an interaction between individuals – an interpersonal process, which allows focus on what is occurring between individuals (notably a novice and an expert – see below) within a learning environment. Rogoff (1990) advances on the social mediation of learning through her consideration of participation in social practice as being equal to learning. Each of these makes a contribution to the role of the social on development and learning as being through interaction or participation.

2.2.1 Learning processes

Vygotsky (1978), who worked within child developmental studies, viewed development and learning as adaptive processes which can best occur with assistance from a more experienced social partner. He proposed that the potential scope for individuals’ learning was far greater when assistance could be provided, than when the child learnt through discovery alone. Vygotsky’s (1978) “zone of proximal development” is
defined as the difference between what a child can do unassisted and what they can do with the assistance of a more experienced individual or a social artefact. This means that for an individual, a novice – working within their ‘zone of proximal development’, understanding can be gained by watching an expert perform the task (abstraction) allowing the novice the guidance of the more experienced individual and the opportunity to develop through imitation of the performance by the expert.

Vygotsky’s (1978) work, in effect, describes the processes that can occur within a learning environment such as found in classrooms, the workplace and in online learning environments through provision of assistance to the learner by an expert or more experienced partner. That is, the expert can assist in extending the learner’s development beyond what they would achieve through the own construction efforts alone. These processes provide the basis of the learning potential of a learning environment because they assist in the realisation of the construction of knowledge that has a high degree of intersubjectivity.

When attempting to understand the learning potential of involvement in any social interaction, the variety of activities undertaken can lead to a set of structured processes which in turn lead to the realisation of intended learning outcomes. A common feature is the social mediation of learning, which is a source of social assistance for making knowledge accessible to the learner. This mediation can be provided by other individuals in the form of guidance (Rogoff, 1990), such as objects, texts or other artefacts. This plurality of processes implies that there is no single or ‘best’ way of interacting, but rather numerous ways, with perhaps quite different underpinning processes (inter-psychologically) and quite different outcomes arising (intra-psychological). Many of these ways relate to the separation of expert and novice which leads to understanding by way of ‘imitation’, that is, the novice imitating and appropriating activities and/or sets of activities. Furthermore, the role of imitation in learning can add insights to the concept of the zone of proximal development (Vygotsky, 1978 p87).

The important point here is that the knowledge to be learnt does not have its genesis in the individual, but in the social world beyond the individual (Lave and Wenger, 1991, Newman et al., 1989), yet it is ultimately constructed through interactions between the individual and the social world. Therefore, interaction with social partners or socially derived artefacts is necessarily important. Moreover, beyond
being sources of knowledge, the social in the form of experienced partners can assist with scaffolding and support learning. For instance, posing questions to an expert can provide the basis for novel approaches to problem solving.

The zone of proximal development can be a useful tool for discussing the processes involved in interaction between individuals and their tutors in a learning environment. A recurrent theme in discussions on learning is the notion of guidance or interaction, much of it directed to correct a previous emphasis on didactic teaching, as in a lecture. Interactions in learning environments have been postulated as being of at least three kinds: (i) less experienced-more experienced individuals (student-teacher or novice-expert); (ii) individual-artefact (student-material); and (iii) peer interaction (student-student) (for example, Boettcher and Cartwright, 1997, Moore, 1988) each with its own relationships and potential legacies. This broad concept of guidance includes guidance by text (student-material interaction), guidance by expert (student-teacher interaction), or guidance by peer (student-student interaction). Thus a learner may interact with a text in isolation, with an expert (with or without a text) or with a peer (with or without both a text and an expert). Each form of guidance is not necessarily mutually exclusive. This blurs the boundaries of analyses of guidance/interaction and has different characteristics and bases for generation of outcomes. For instance, a classroom situation may include students reading from a text and discussing concepts with a teacher and/or with their peers in both small and large groups, which represents one set of inter-psychologically processes. Thus, all forms of guidance/interaction contribute to learning environments, albeit in different ways.

Hatano and Inagaki (1991) elaborate this by postulating two main forms of interaction – horizontal and vertical. Horizontal interaction is the interaction between peers, while vertical interaction is the interaction between a more able individual and a less able individual (which is analogous to Vygotsky’s zone of proximal development). They postulate vertical interaction as more formal, which suggests a power differential between members and consequently, the knowledge generated is not challenged by the “less mature member” (Hatano and Inagaki, 1991 p333). Most generalised observations of learning, like Hatano and Inagaki’s, do not overtly include interaction of student with material (as in electronically mediated interaction), but emphasise only those interactions between conscious entities (people). Hence, Hatano and Inagaki’s conception of interaction places more emphasis on directed guidance than more distal
forms of guidance such as interactions with artefacts, and indirect interactions with other humans. This parallels Rogoff’s (1990) view of guidance as being of two general forms: explicit (directed) and tacit (generalised). In her view, the sharing of focus and purpose between novice and expert allows for direct guidance and results in moves towards intersubjectivity (shared understanding). This is more difficult to achieve when direct interaction or proximal guidance is unavailable. Hence, less direct or distal forms of interaction or guidance may be required. However, both their processes and outcomes may differ from more proximal forms of guidance.

2.2.2 Learning and mediation

Central to a consideration of guidance/interaction, similar to Hatano and Inagaki’s (1991) and Rogoff’s (1990), is the importance of speech and language through which guidance occurs. This is because the majority of interpersonal interactions involve some verbal communication, both written and spoken. Vygotsky (1978, p26) also emphasised the “vital importance” of speech such that “if not permitted to use it, young children [and perhaps others] cannot accomplish a given task”. All these represent instances of mediation in learning. The nature of the interaction/activity as being mediated by tools (for instance, the computer and speech) is also brought to centre stage using a Vygotskian-based approach, which emphasised the importance of symbols. This allows a focus on the activity of participating/interacting in an online learning environment particularly given its ‘non-physical’ social nature. That is, it does not permit the kind of immediate face-to-face interpersonal interaction that is often a common feature of models and approaches of direct or proximal guided learning.

A further development in definitions of interaction leading to mediated interactions is provided by a recent discussion on interaction in the International Forum of Educational Technology & Society (IFETS), which proposes six primary types of interaction: (i) student-student; (ii) student-teacher; (iii) student-content; (iv) student-interface; (v) teacher-teacher; and (vi) content-content (Muirhead and Juwah, 2003). Each of these forms of interaction provide insights into the ways in which students may approach learning. Four of these, student-student, student-teacher, student-content and teacher-teacher are firmly grounded in previous research (teacher-teacher being the reporting of research), while student-interface is a relatively new area being covered by this and other research projects (e.g. Taynton, 2000). Content-content interaction, however, ignores the mediation of humans, which is the basis of sociocultural views of
learning. Thus, attention is now being drawn to issues involved in mediated learning (student-interface), particularly within online learning environments. Further, there are classifications of mediated interaction (Sims, 1995) by learner activity with content at the human computer interface including: object interactivity (e.g. interacting with an object on a web page – point and click); linear interactivity (e.g. following a set path – page turning); update interactivity (e.g. part of the feedback loop of computerised learning programs – computer response to activity); construct interactivity (e.g. simulations – interacting with various constructed computer simulations); and hyperlinked interactivity (e.g. navigation through a knowledge base). However, these forms of interactivity may de-emphasise the social, interpersonal aspect of the sociocultural contribution to learning, which also constitutes relations between individuals.

This focus on the learner’s activity in a social environment is further emphasised by Rogoff (1990), who uses Vygotsky’s sociohistorical perspective of placing mind in society in central focus, to determine that “the basic unit of analysis is no longer the (properties of the) individual, but the (processes of the) sociocultural activity, involving active participation of people in socially constituted practices” (Rogoff, 1990 p14). Thus, while attention to the individual is necessary, the activities in which individuals engage, particularly within social contexts, are perhaps most salient to analyses of learning environments and are constitutive of the environment because of both constraining and enabling aspects for the learner. Furthermore, in an online learning environment, individuals are apparently present only in their interactions with others, in the ‘socially constituted practice’ of engaging with others in dialogue that is textually based. This means each individual is only cognisant of others in their reading of others’ messages and those they send in reply. Social interaction may be a factor assisting an informed dialogue that can assist shared understanding or meaning.

Taking this view further, Nystrand (1997, p8) discusses the dialogic nature of discourse when highlighting the importance of classroom interaction. This is not simply because speakers take turns, but because dialogue “is continually structured by tension, even conflict, between the conversants, between self and other, as one voice ‘refracts’ another”. For instance, working through a problem, even as a solitary worker, requires a dialogic interaction with the self, which allows the problem to be teased out and investigated. Nystrand’s investigation of classroom discourse in which he delineates
“authentic questions” and “test questions” (p38) raises important considerations for the interactions available to students in class settings (which is analogous to online learning environments). Authenticity, according to Nystrand (1997), is whether or not there is a “prespecified” answer to the question (p37), which would negate the possibility of deep engagement by the student. An example of an authentic question is “how may we define interactivity in this context?” “Test questions” (p38) on the other hand, are those for which the student provides a rote answer which is inherent in the question or for which there is only one answer for which the teacher is ‘fishing’ (e.g. ‘What is the capital of Australia?’). Posing authentic questions in discussion and small group work, in Nystrand’s view, provides for the “significant and serious epistemic roles” for students when related to serious instructional goals (p72) and relates to the differences between ‘deep’ and ‘surface’ learning; that is, authentic questions allow construction of knowledge. On the other hand, some conceptions of learning, particularly those based on the ‘test question’, have relegated the individual to a passive role, requiring little effort and the epistemic role of a bucket or a sponge. However, individuals do more than simply soak up knowledge and are not simply the proverbial ‘empty vessels’. Analogously, in terms of electronic interaction, these types of questions do not allow a flow of ideas which when brought together create further understanding in participants and the potential for further questions. Therefore, interactivity requires some form of dialogicity in order to facilitate the knowledge construction of individuals.

Nystrand’s (1997) view of the dialogic nature of discourse and authenticity can be built upon using Bakhtin’s (1986) conception of speech genres which gives insight into epistemic roles beyond the ‘bucket or sponge’. For instance, both authentic questions and text questions are instances of what Bakhtin refers to as ‘speech genres’. This is because the form of interaction is consistent within a particular environment. Bakhtin describes speech genres in terms of the ‘concrete utterance’, a specific instance of dialogue, within each sphere of language use. Each speech genre gives rise to a series of relatively stable types of utterance. The concept of speech genres pays attention to the extreme heterogeneity of speech, both oral and written, which Bakhtin considers and which Newman et al. (1989) also refer to where opportunities for intersubjectivity are lacking. This means that particular forms of speech or interaction enable specific responses while constraining others (e.g., authentic and test questions). Bakhtin (1986) divides speech genres into primary speech genres and secondary speech genres. He does this to facilitate the distinctions between everyday communication and more
formal cultural forms of communication. Primary genres are simple, “unmediated speech communication” which are the foundation of the everyday communication forms used as the basis for interaction. These simple acts have “immediate relation to actual reality and to the real utterances of others” (1986 p62). Secondary speech genres, on the other hand, are complex, “highly developed and organized cultural communication” such as the novel and scientific research reports (1986 p62). From this perspective, the objective of learning interactions could be to provide an opportunity to acquire exposure to relatively uncomplicated secondary speech genres (science, social science, mathematics) using primary genres. In other words, simple forms of utterances provide a basis for developing, entering and understanding secondary genres. This is important because it implies that the majority of knowledge construction occurs through the use of primary utterances as the basis for learning secondary genres. For instance, learning numerical facts (e.g. number values etc) can lead to more complex mathematical concepts such as multiplication and division, which in turn lead to more complex forms of mathematics. Each is premised upon understanding previous ‘facts’. For other disciplines, similar rules apply; gaining understanding is premised on previous knowledge often displayed through verbal and non-verbal face-to-face interaction. The complexity of the activities being engaged in reforms the utterance at each stage. Consequently, a learner in a text-based, electronically-mediated environment may need to reform their utterance in order to engage and participate fully.

New forms of generic utterances are opened by the changing nature of learning environments, such as within a mediated online provision. These utterances are both primary, simple utterances for discussing concepts, (e.g. requesting elaboration of a concept), and secondary within highly organised cultural communication media (the Internet). For example, many learning paradigms introduce basic secondary speech genres utilising primary genres that are easily acquired by learners. Lave and Wegner’s (1991) legitimate peripheral participation, for instance, provides a basis for understanding learning in context in which novices learn from experts who may be able to explain processes simply while introducing more complex aspects of the tasks. In some ways, the primary genres are those available to the novice, while the secondary genres are those introduced by the expert. This is because our everyday experiences tend to rely on primary genres, while interactions outside of this, particularly working and learning, rely on more formal secondary genres. Thus, our everyday utterances,
particularly those used in electronically mediated environments, are simple, but change with the context.

In both primary and secondary speech genres, Bakhtin describes an utterance as a link in “a very complexly organised chain of other utterances” (1969 p69). Thus the dialogic nature of communication may be found in the “change of speakers” that occurs at the “boundaries of each concrete utterance” (p71). Within online learning environments each message (or email) may constitute a ‘concrete utterance’, each with a specific purpose and different expectations and thus a distinct genre. The choice of speech genre is determined by the intent of the speaker. In essence, an individual engaging in a dialogic exchange may seek to determine how they will approach the interaction. The importance of this is that if their objective is to intentionally learn something, their approach will be couched in terms of questions, while different utterances may arise if their approach is to impart information in a learning environment. The speech genre incorporates a typical form of utterance and as such the genre also “includes a certain typical kind of expression that inheres in it” (p87). Thus, an individual may only engage in an interaction using the typical forms of utterance available for that interaction within the genre, because other non-typical forms of utterance become decontextualised and non-sensical in the given genre. For instance, academic discourse would not be used in light social interactions among family and friends, or in the back streets of a modern city nor would grammatically correct, third person language be used in a mediated text message. Goodnow (1990) exemplifies that requirement, noting the need to be seen to be cool and logical in work planning situations, spontaneous and light in social situations, and emotional in romantic situations. So there are situated or contextually specific utterances, including those favoured in electronic-based interactions. This has spawned a form of contextualisation known as emoticons – icons that display the emotional state of the participant such as the happy face ( :-) ), the sad face ( :-( ) and the wink ( :-) ) to indicate emotions or the level of seriousness of a comment. Therefore, each context or situation has a set of utterances that are appropriate and that allow certain activities to take place, such as engaging in learning activities.

In summary, it is proposed that features inherent in communication may need to be reformed and reconceptualised in order for text-based communication to mediate
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communication and, hence, learning. Learning mediated by language becomes further mediated by mediating technologies such as the computer.

2.2.3 Mediating mediation

Because of this specificity to situation or context, the mediated learning environment requires a level of competence with an intervening technology, such as a computer, and artefacts, such as the screen and the software. These technological artefacts mediate interactions between individuals and place additional burdens on the use of the primary genres that are no longer simply ‘uttered’ but must be ‘uttered in writing’. Each interaction in the mediated environment can require a level of construction that is not necessary within a face-to-face situation. A question and answer session in a face-to-face setting, has an immediacy which contributes to the construction of knowledge not evidenced in a text-based environment. Consequently, an utterance in a mediated environment becomes stripped of some of its contextualising features, such as body language, and is reduced to a simple ‘words in sequence’ form of communication.

It is this contradiction within the utterance in mediated environments that needs to be investigated. This is because the complex patterns of communication are reduced to their essential features but are still viewed as a complete communicative form. For example, an email can contain a greeting, the contents (such as a question or some other form of communication) and a closing, in much the same way as in a traditional letter. But it may also be simply the question without the contextualisation traditionally used in traditional letter writing. There is also the impact of delay between utterances which can be manifested in an exacting kind of informality as individuals negotiate a message with increasing attention to detail to deflect misinterpretation. A single utterance in ‘cyberspace’ is also both simple in its dialogic nature, such as a question or response, and complex in that it can be a ‘chain of utterances’ in one message. It can comprise a series of questions, a response to a previous question with a follow-up question or a series of responses to other questions. The responses can be direct or interspersed with the previous utterances (using the included text feature of electronic mail programs), giving rise to a different form of dialogue. Sofia (1995) refers to the disjunctive possibilities of such interactions in computer-mediated environments due to the possibility of permitting interactions between people who may never meet in a physical sense, as exemplified in the early discussion about intersubjectivity and differences in interpsychological processes that comprise proximal and distal guidance.
The separation by mediated text requires a textual identity, which may be disjunctive to an individual’s real world identity. That is, the identity of individuals engaged online may be differentiated from their real world identity – a student’s email address may be their student number at the university thereby separating them from other potential identities such as their name. The textual identity, that is the email address or online identity, may move individuals to a more open way of interacting due to the need for precision in communication (Hedges and Mania-Farnell, 1998). This may lead to opportunities to clarify meaning or move easily to intersubjectively or shared understandings. Conversely, the absence of social cues may disrupt these opportunities. Sudweeks and Simoff (1999, p31) reveal the issues of mediation by asking whether we should “consider the Internet an environment in itself … consider it a complementary part or an extension of our own environment” or whether it is the interaction between the users and the technologies that form the environment. This complication of the boundary of an (cyber) environment is particularly relevant when contemplating learning, because the boundaries of the environment change for each individual and each environment. These issues point to questions about the materiality of the mediation being undertaken and the mediational means being used to constitute a learning environment.

Thus, interactions are socially constituted, constructed and mediated. Different understandings of interactions and the bases for interaction lead to different kinds of learning activities. Deep reflection within the interaction, for example, can lead to shared learning with new insights such as that described by Russell (1997). The dialogicity of the interactions, particularly its textual nature in online learning environments, is an important part of any analysis of an online learning environment, given that interaction occurs through computer mediated learning via text when the individuals may never meet. It represents a different form of interaction than that which occurs in face-to-face teaching situations and which is now being widely adopted by educational institutions – yet its dialogical, and, hence, pedagogic properties remain poorly understood.

The forms of dialogicity and textual intersubjectivity inherent in online interactions, the way in which the mediating technologies disrupt interaction and Sudweeks and Simoff’s (1999) observation about how to define the environment in mediated situations all point to the need to develop a framework to define the
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environment. This is of particular relevance in discussions of learning in mediated environments, as many assumptions are made which construct the learning environment prior to its population by students, the actors, undertaking the purpose for which the environment is created. Many frameworks are available to assist in this, however Burke (1969) proposes a framework that pays attention to the elements within an environment. This framework is discussed in the next section.

2.3 Elements of a learning environment – the Pentad

The activity of constructing knowledge can be taken as occurring within any situation where individuals think and act (Billett 2003), and that requires a role more active than being mere passive recipients of socially derived knowledge. An individual often requires a role – a way of acting – to define their activities. An individual can take on the role of learner or student which gives rise to different ways of engaging in knowledge construction. Indeed, someone engaged in learning is referred to as a learner, as someone undertaking activities that may result in knowledge development. This allows attention to what students do and why, in other words, how they act. Burke (1969 p xv) pays specific and detailed attention to the question “What is involved, when we say what people are doing and why they are doing it?” This is a central question addressed in this research – what are students doing (i.e. activities) in an online environment (i.e. where) and why are they doing it (i.e. purpose(s))? It includes individual interaction and engagement, and the purpose(s) for that engagement. All this is salient to understanding learning and processes that support it because interactions between individuals are necessary for learning, as discussed above.

Burke (1969) proposes five terms or pentadic elements to assist in understanding what interaction students engage in and how learning progresses through these interactions. They are:

Act, Scene, Agent, Agency, Purpose. … any complete statement about motives will offer some kind of answer to these five questions: what was done (act), when or where it was done (scene), who did it (agent), how he did it (agency) and why (purpose). (p xv italics in original)

Using Burke’s terms in the context of online learning environments, the term ‘act’ – what was done – works on multiple levels. An act is what the student engages in. It can be learning in a generalised form, as in a student learning the importance of adequately defining terms within an assignment, or a specific form, as in a student learnt the correct
procedure for selection within a programming language. The act of learning, as discussed above, can also encompass the act of interacting. Thus the exchange of ideas can constitute the act of learning. This act of exchanging ideas is further constituted by asking questions and responding to questions, which facilitate any exchange. Thus, an act can be a global referent or a specific referent. The individual acting is also linked to the learner and learning through the association of activity with cognitive changes in what the individual knows (their learning).

The scene is where and when an act occurs. In some ways, the scene contains the act (Burke, 1969, ); the scene both enables and constrains the act. It can be viewed from a global perspective, as in the learning environment, or in a context where the act occurs. This could be within a course of study which defines what is to be learnt; what acts are appropriate. Further, the physical constraints of the location of the student interacting in a computer-mediated environment can be reduced to the interface or the screenface. Thus, the scene can be defined in terms of simple descriptors or more complex interactions between those characteristics that help define where and when an act is taking place.

Likewise, the purpose of the act is why the act is being undertaken and also has multiple levels. The purpose for being involved in a course can be to complete a qualification or to gain new knowledge. The purpose of being engaged in activities within the course may be to gain deeper understandings of the material, to get a good mark (in the course or in a particular piece of assessment), or simply to pass the course. Thus, at one level, the purpose of involvement in the course is ‘learning’ and those purposes may change in intention and scope to complete an assignment with a passing mark.

The agent is the person who undertakes the act, alternatively referred to as a learner or a student depending on context. The generalised term ‘learner’ incorporates a range of less structured opportunities beyond a course of study, whereby the more specific term ‘student’ can be applied. Agents, as a broad heading, can also have their acts modified by co-agents. The co-agents of learners are their peers and teachers, whose combined efforts can result in learning, particularly given the dialogicity of intersubjectivity discussed above. The term ‘agent’ also applies to the teachers interacting with student learners.
Finally, agency describes the means or instruments the agent employs in undertaking an act. Thus, the agency for learning, particularly in mediated environments, has multiple meanings at a global or local level, ranging from the global ‘internet’ technologies to the program with which to interact with the technology (in its specific form of electronic mail). These definitions are summarised in Table 2.1. Chapters Four and Five provide greater depth to these definitions in terms of this investigation.

<table>
<thead>
<tr>
<th>Element</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>Act</td>
<td>learning, interacting, questioning, responding</td>
</tr>
<tr>
<td>Scene</td>
<td>learning environment, course, computer-mediated communication, screenface</td>
</tr>
<tr>
<td>Purpose</td>
<td>learning, getting degree, passing course, getting information about assignments</td>
</tr>
<tr>
<td>Agent</td>
<td>learner, student</td>
</tr>
<tr>
<td>Agency</td>
<td>computer, email, internet</td>
</tr>
</tbody>
</table>

Table 2.1 Initial description of pentadic elements within an online learning environment

Burke (1969) describes a number of pentadic interactions, particularly the scene-act, the scene-agent, and the act-agent ratio in order to elaborate how each element interacts with others, as in Radney's (1996) description of the influence of what was done on how it was done. These interactions are important as discussed above, because similar acts may be undertaken for different purposes. In terms of the scene-act ratio, the primary concern is, in effect, that the “scene is a fit ‘container’ for the act” (Burke, 1969 p3). In other words, whether the scene reflects, and provides space for, the act. More specifically, the act cannot occur outside its scene (whatever that scene may be) or else is modified and no longer constitutes the same act. Further, Burke utilises the militaristic maxim “terrain determines tactics”, meaning essentially that the ‘scene’ (terrain) allows certain ‘acts’ (tactics). In terms of a mediated environment, some acts have no form or possibility outside the environment. For example, sending an electronic message is premised on a mediated environment. This maxim (terrain determines tactics) and Burke’s use of it essentially dictate that the possibilities of what an individual can do is, in part, bounded by what is available and doable within the particular setting. Thus, a student in a class (i.e. agent in a scene) may not be able to ask nor answer authentic questions due to the rote nature of learning being presented or some other feature of the environment. Likewise, asking and answering questions in a textually mediated environment takes on different characteristics, which lack the spontaneity and immediacy available in a co-physical environment. This is because
delays in inter-personal interactions occur which may disrupt the flow of conversations and, when individuals are not co-present, the social cues of body language and facial expression are absent.

The scene-agent ratio often conflates the “nature of the inhabitants”, that is the characteristics of the actors of a scene, with the nature of their habitation (Burke, 1969 p9). Thus an ‘ideal locale’, a natural environment, for a particular kind of agent is assumed to be determined by the characteristics of the agent. A student is assumed to be located in a classroom, library or other seemingly educative location. Likewise, those located in classrooms must be students or their co-agents, teachers. However given the increasing emphasis on ‘flexible’ learning methodologies, distance and online education, the agent no longer has an ‘ideal locale’ and may be found anywhere, although different constraints may apply in different locations. For students in an online class, particularly externally enrolled students who are separated physically from the university, the computer screen, the screenface, becomes the interface for displaying the presence of others and is often the only place where this presence is felt. The screenface has been defined previously as the appropriation of the screen of the computer together with the desktop or operating system and any intervening computerised applications. With increasing emphasis on computer mediation in learning, the scene in effect becomes the ‘screenface’ where the interaction is presented in discrete messages, text blocks, and ideas that may be formed and reformed (responded to). Each message, text block and idea can be seen to be analogous to Bakhtin’s (1986) concept of the utterance given the complex chain that organises the utterances into a particular speech genre or a conversation.

Using Burke’s terms in a mediated environment, the act of sending an email (containing an utterance) requires a computer, a keyboard and a screen. Thus, this act is within a defined scene for the individual agent. This narrow definition of the scene inheres in the act. That is, an email, generally, cannot be sent without a computing device. However, there is also the larger scene of the ‘Internet’ without which the act of sending an email also has no meaning. The computer, the screen and the keyboard can also be defined in terms of agency, as the ‘how’ of communicating/interacting with others. Thus, act and agency are both partially defined by ‘sending an email’. The scene may be elaborated further within an email discussion list and within an
educational setting by the course in which the email is sent and at a broader level, by the institution within which the course in undertaken.

The act of sending an email within an educational setting is also bound within a broader definition of an act, that of learning, because the purpose of sending an email inheres in this broader definition. Thus, learning (sending an email) is an act with a purpose. Learning in this way comprises both an act and a purpose. Within this act/purpose is the act of interacting, which is bound by scene (where – course, institution, screenface) and agency (how – computer, Internet). Underlying this, of course, is the agent – the student or learner.

The act of interacting is constituted by receiving email, reading email and at times reacting and responding to (sending) email. Thus, the act of interacting is constituted by many ‘mini’ acts - microgenetic or moment-by-moment learning processes (Rogoff, 1990), such as composing a message, reading a message and sending a message, each with varying purposes: asking a question, finding an answer, requesting elaboration. The act of learning is also constituted by microgenetic processes (reading, writing, and so on). The definition of learning and its associated activities at each point is determined by the level of focus inherent in the analysis to be undertaken, that is, interacting, reading and so on.

Thus, an analysis of a learning environment requires analyses of scenic and purposive aspects, attention to the agent, the agency, and the act/s because each of these elements provides a differing lens through which to view the interactions. Interactions allow individuals to participate in activities that may be impossible for them to complete alone, “using cultural tools that themselves must be adapted to the specific practical activities at hand, and thus both passed on to and transformed by new members of the culture” (Rogoff, 1990 p16). Thus, the individual, their social partners and the sociocultural context become “differing angles of analysis of an integrated process” rather than “independent ‘influences’ or factors of development” (Rogoff, 1990 p26). The integrated nature of these differing angles, similar to Burke’s pentadic elements, needs to be accounted for even when focus is placed on one or another process. Many complex systems, such as a rainforest, display interconnections that need to be accounted for in their processes. A rainforest displays rich biodiversity and complexity. Attention solely to a single part of the system, such as the canopy, and what is occurring there, will fail to understand the complexity of the system.
In summary, while Burke’s (1969) work provides a useful framework for discussing and describing an online learning environment, there is not really a theoretical frame on learning that accompanies this. The pentadic elements aim to ensure that all aspects are viewed. This means that attention is paid to the agent – the individual undertaking the act; the act itself; the method by which the act is undertaken (agency); the purpose for the act; and the location or scene of the act. Using Burke’s terms provides a greater definition of who, where, when, why and how and allows the elaboration of interactions between the elements. In this way, it becomes clearer that the act, whether learning or interacting, cannot take place without the location or scene being included. Similarly, the act is dependent on the actor or agent doing it. Wertsch (1998) uses Burke’s pentad in this manner, to allow him to consider tensions between elements although Wertsch focuses on two specific elements, namely (i) agent and (ii) mediational means (agency) using ‘mediated action’ as the key feature of investigation. These elements are favoured because the sociocultural approach explicates the “relationships between human action, on the one hand, and the cultural, institutional, and historical contexts in which this action occurs, on the other” (Wertsch, 1998, p41).

Wertsch’s (1998) notion of the irreducible tension between the agent and the mediational means is important, because it sits at the heart of the interaction between the individual and the social. In effect, the analysis becomes one of agency, which cannot be wholly separated nor fully discussed without reference to at least one of the other pentadic terms. In this way, agency, or the mediational means, underscores all aspects of the learning environment. Simply put, the ‘how’ of learning is essential to discussing other aspects because without this clarification, the number of variables, which can affect learning, are vast and may be very different for each learning environment. This parallels other discussions of learning, which are often referred to as ‘classroom’ learning, for instance. The classroom is not only a ‘where’ but a ‘how’. The classroom defines how we can teach and/or learn. Many examples of this tension are evident in discussions of learning, although there appears to be an unstated assumption about the effect of the scene. In other words, each of the elements, while allowing specific information about the environment, incorporates both stated and unstated assumptions about other elements.

While Burke’s (1969) analysis works well as a theoretical concept within literary studies, it becomes less theoretical within a learning environment where ‘motives’
cannot be described in terms of a ‘grammar’. The rules for a ‘grammar of learning’, which could parallel Burkes ‘grammar of motives’, are too diverse and dependent on the environment, in effect, the scene and the individuals within that scene. As a result, the pentad presents as a valuable methodological tool for investigating how concepts within learning theory offer an understanding of learning in a specific environment, yet which are outside a simple Burkean approach. Using a Burkean methodological frame allows specific attention to, and elaboration of, individual elements, which is useful to any discussion of learning. The focus cannot exclude individual agency – how people are learning – in relationship with one or more pentadic elements, who they are, where they are, how they are doing it or why. This, then, provides the basis for examining the tensions between each of the pentadic elements.

2.4 Relationships between elements

The friction arising from the mediated nature of texts and tools is often viewed as a form of immateriality that does not have a physical form. Wertsch (1998 p31) discusses how “seemingly immaterial cultural tool[s]” such as spoken language have a form of materiality that may be only of momentary existence, making the materiality of speech as a cultural tool difficult to grasp. McWilliam (1997) laments that “the epistemologies that underpin new information technology and instructional design include the assumption that the teacher’s body is simply (im)material to pedagogical processes”, that is, that learning can occur without direction or guidance from an ‘expert’. While this case may initially appear convincing, most learning even outside ‘formal’ courses occurs as a result of interacting with a book, presumably written by an expert; a peer, who may have previous experience and thus be loosely categorised as an expert; or a mentor, presumed to have previous experience. In each case, the body of the expert is inherent in the learning situation because a book implies a physical author. Thus, learning can be defined, in broad terms, as interaction with an expert.

However, the perception of immateriality is inherent in discussions of virtual technologies. The Internet itself is often viewed as ‘an immaterial object’. Online learning environments, while having a more enduring existence in the form of archives, also feature a seemingly immaterial nature, yet this maybe misleading. The individuals with whom one interacts are not physically present and may not be temporally co-present (i.e. they may have sent their message at some time in the near or distant past).
Thus, any text, any interaction, may have an ephemeral existence whose meaning may not be easily understood from a simple reading thereby delaying clarification and resulting in a loss of understanding. This means that each act foreshadows the possibility of further acts of clarification or meaning-making, which moves the utterance (interaction) from the simple to the complex.

Relationships people have to technologies, as mediational means, are often simplified and reduced to the “technophobia/technophilia binary” (Sofia, 1995 p148). Wertsch (1998), as already stated, emphasises the irreducibility of the interrelatedness of human action and the cultural, institutional, and historical contexts in which this action occurs with respect to mediational means, thereby going beyond the simple binary. The claim of interrelatedness influences analysis particularly in terms of Burke’s pentad. A focus on the ‘irreducible tension’ between agent and agency (i.e. mediational means) results in the erosion of the boundaries between them. The discussion of one relies on the explication of others, including act, scene, and purpose. Thus, agent becomes “individual-operating-with-mediational-means” foregoing an assumption that “an agent, considered in isolation, is responsible for action” (Wertsch, 1998 p26). In other words, the agent is unable to act within a specific scene without the cultural tools, or mediational means, available within that scene. Within the screenface, electronically mediated interaction could not occur, neither could it occur as intended unless there was a clear intention. Various mixes of the pentadic elements, and the dynamic tension between them, contribute to a form of irreducible tension that Wertsch (1998 p99) refers to as “multivoicedness”.

Texts that might otherwise be considered to be products of our own efforts – involves at least two voices: the voice of the cultural tool … and the voice of the agent producing utterances in a unique speech situation. In some cases, these two voices may come together in harmony or even seeming unison, and in others a great deal of discord or dissonance may be in evidence. In all cases, the fact that two voices are involved gives rise to one or another form of “multivoicedness”. (Wertsch, 1998 p99)

Multivoicedness is a central part of computer-mediated communication, as the fluency of an agent with the technology can cause discordance or harmony. Likewise, the forms that agency can take, the roles available to an agent, contribute to various forms of multivoicedness. An individual acting in a learning environment, such as in online learning, is both constrained and enabled by the role of ‘learner’, that is the acts that give rise to learning. Their ways of interacting require the purpose of learning to be
inherent and to incorporate multiple perspectives on interaction. Taken even further, this gives rise to the notion of “multiple mediational means” (Wertsch, 1998 p100) in the form of agent acting in the role of learner acting with a computer connected to the Internet providing access to learning material. Each cultural tool (italicised in the previous sentence) provides a layer of mediation between the learner (agent) and their learning (act). In effect, an individual needs to be able to negotiate each layer, each means of mediation, to achieve a more complex form of agency within the scene. This assists with the determination of the ‘agent’ in this inquiry into online learning as ‘student interacting with computer/internet/learning materials/others’ and illuminates one of the major problems with unreflective use of online learning environments. The differences between this notion of multi-mediated learning and other notions of learning (agent acting with mediational means, specifically language and content) may provide the basis for many inconsistent understandings of the nature of online learning environments. This is perhaps because assumptions made in the reduction of agency to a single form neglect aspects of multi-mediated environment.

Inconsistencies also arise due to the fact that learning, particularly in online learning environments, has “multiple simultaneous goals” (Wertsch, 1998 p34). These arise because the goals of the learner (agent) do not map precisely onto the goals of the electronic interaction. For instance, one of the goals of participating for students is often related to passing assessment, rather than ‘learning for learning’s sake’ which might be knowledge of the goal of the education system. This brings into focus the differences between the ‘intended use’ of a learning environment/activity and the ‘enacted use’. This means that students may subvert the purpose of the learning environment by asking questions that focus closely on answers to assignments, thus gaining an advantage, skipping the construction of knowledge and relegating themselves to the epistemic role of bucket or sponge. They are simply taking in the information without ‘learning’ it and then reproducing it in ways consistent with course requirements. The mapping of these differences of what students intended and how they enacted those intentions, as well as the intended use by teachers reflects the constructed nature of reality and human activity that comprises the intentions and goals individuals generate which to a greater or lesser degree are the product of conflicting social purposes. For instance, contemporary students often have to balance their time between paid part-time or full-time employment and their studies, social obligations and other distractions. Thus the relationship of agents towards mediational means is
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important and may be characterised as ‘mastery’ or ‘appropriation’ (Wertsch, 1998, Wertsch and Toma, 1995) or the lack thereof. Indeed as Eyman (1996) notes:

The awareness of a socially situated self (achieved at least in part through the use of appropriation) and the ability to engage that awareness in written discourse is a necessary accomplishment which prepares the student for engagement in a dialogic discourse with others' voices and texts. (online)

This implies that each individual must engage at a social level with others, both novices and experts, in order to appropriate knowledge.

Wertsch (1998) imbues both concepts (mastery and appropriation) with more precision than the term internalisation (1998). Mastery is viewed in terms of “knowing how” (Ryle, 1949, in Wertsch, 1998) to use a mediational means. ‘Knowing how’ allows an agent to function with a cultural tool. For instance, knowing how to operate a computer, at its simplest, requires knowledge of how to start one up, how to launch an application and how to use that application. Appropriation, on the other hand, infers the process of taking something that belongs to others and ‘owning’ it. In the above case, appropriating the use of a computer could be for everyday purposes, such as a calculator, weather forecaster, accommodation and travel booking artefact, to make notes, using it within daily routines as well as personalising the interface to reflect particular ways of working (e.g. bookmarks in web browsers). According to Wertsch (1998 p56), “in many instances higher levels of mastery are positively correlated with appropriation. However, … some very interesting forms of mediated action are characterized by the mastery, but not the appropriation of, a cultural tool”. This may lead to individuals using a cultural tool with feelings of ‘conflict or resistance’; the student (agent) who engages reluctantly with electronically mediated interaction may, as a result, be engaged in mastery rather than appropriation.

What Wertsch (1998) perhaps de-emphasises in his discussion of mediational means, which is particularly relevant to a consideration of learning mediated by various electronic cultural tools, is the relationship between the novice and the tool. While mastery is often assumed in Wertsch’s discussion of the use of mediational means, the central focus within education is the process of achieving mastery, of moving an individual from ‘not knowing’ to ‘knowing how’. Hence, the very structure of higher education with its division of courses into the introductory or advanced levels can be seen as focusing on the process of achieving mastery. With the use of multiple mediational means within an online learning environment, the lack of mastery, or the
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novice status, of an individual with any of the layers of mediational means within the learning environment can create not only feelings of conflict or resistance, but outright rejection of the mediational means within the agent-agency relationship. This may be due to transformations of the perception of the activity or the enacted use of a mediational means particularly the interaction between the act-scene-agency pentadic elements. Put simply, each of the various layers – the role of learner, the computer, the Internet, and the learning material with which an individual must act – requires a certain level of mastery. For the student who is a novice computer user, the learning material may be inaccessible. Rather than acquiring mastery of the computer and Internet, the student may forego the opportunity to learn within that environment because they view the environment (the computer/screenface) as not conducive to learning. Whereas engagement with a social practice is held by Lave and Wenger (1991) to lead to the identification with that practice, Hodges (1998) demonstrates how it can lead to dis-identification.

The interactions within the three pentadic elements, which Wertsch (1998, p25) refers to as ‘mediational means transform[ing] mediated action’, are evident in the discussions of other writers in the area (for example Edwards and Clear, 2001, Johnson, Sutton and Poon, 2000), although there is little emphasis on the individual-operating-with-mediational-means. Like the transformation caused by the introduction of the aluminium, and then the fibreglass ‘pole’ in pole-vaulting discussed by Wertsch (1998), changing the mediational means in education can have the effect that some individuals will be unable to adjust (resistance/refusal/incapacity), some will master the medium, while others will partially or totally appropriate it. These differences are often glossed over in favour of the less contested benefits of online learning environments for the sponsoring institutions. An important point made by Wertsch (1998, p45) is that “cultural tools provide the context and standard for assessing the skills of an agent”. Similar to the idea that the definition of an individual as a good pole-vaulter depends on the definition of pole-vaulting with a bamboo, aluminium or fibreglass pole, there is a definitional constraint of a good learner on the environment in which that learner excels. This relates directly to the mastery, appropriation or rejection of a cultural tool such as the Internet for learning and brings forth Heidegger’s (1977) notion of questioning (see Chapter One).
Wertsch’s (1998) conclusion that both “mediated action and mediational means are cultural tools … that bring(s) the power of multiple perspectives in the human sciences into productive contact” (p184) is an explicit statement of the concerns that centre on a consideration of learning mediated by online interaction between students. This consideration proceeds from the assumption that no single perspective is able to provide the kind of analysis required to understand students’ participation in online learning environments. Wertsch (1998) begins with the appeal “that we not begin with the assumption that … problems come in pre-sliced disciplinary pieces” (p3). Indeed, Meek (1997) claims that “[h]igher education is so intricate, diverse and complex that no one discipline, much less a disciplinary subfield, has sufficient intellectual resources to understand and analyse all aspects of it” (p174 – emphasis added). Nevertheless, judicious use of various theoretical frameworks which elucidate the potential interactions of individuals within mediated environments can assist in developing a basis not only for understanding, but also allow for the development of relevant questions concerning the use of technology in education.

### 2.5 Elements of educational technology

The delineation of the terms of Burke’s (1969) pentad together with the understanding generated by Wertsch (1998), Bakhtin (1986), Nystrand (1997) and others highlights that aspects of learning are often in tension, with learning being an act, and a purpose. These are used in this research to investigate the tensions between the agent and the mediational means, as elaborated by Wertsch (1991, 1998), as well as tensions between other pentadic elements, most notably the scene, because this is a defining aspect of the learning environment for the individual agent and varies between agents.

Wertsch, Tulviste, and Hagstrom, (1993) elaborate this concern further by stating

> To understand how these mediational means function in human action the boundaries of agency once again need to be clarified. Instead of the individual in isolation, the agent is viewed as being an irreducible aggregate of individual (or individuals in intermental functioning) together with mediational means. (p 341)

A coherent and comprehensive consideration of learning mediated by electronic means needs to acknowledge the intertwined notion of the agents and mediational means within a specific scene, particularly in an online learning environment. This is because both the agent and the means with which they engage become almost a conjoined entity,
for without the computer, the Internet and other paraphernalia of the environment, the agent cannot act. Such a consideration takes as its central concern the interaction between individuals, and extends to how the computer mediates between the individuals. Interactions are also socially mediated (Rogoff, 1990) and different understandings of interactions (both the technological and the social) lead to the implementation of different kinds of learning activities. The dialogicity of the interactions, particularly its textual nature in online learning environments, is an important part of any analysis of an online learning environment, given that interaction occurs through computer-mediated text where the individuals may never meet.

Burke’s (1969) dramatistic analysis using the Pentad is proposed as a valuable methodological tool for investigating how concepts within learning theory offer an understanding of electronically mediated learning. Using a Burkian methodological frame allows specific attention to, and elaboration of, individual elements such that any discussion of learning cannot proceed without attention to scene, where people are learning, in tension with one or more pentadic elements, who they are, how they are doing it or why. Different combinations of pentadic elements, particularly in dyads, (two interrelated elements), provide more a comprehensive analytical frame than many other frameworks.

The power of multiple perspectives, such as found in dyads is an explicit statement of the concerns that centre on a consideration of learning mediated by text in an online environment. This consideration proceeds from the assumption that no single perspective can provide the kind of analysis required to begin to comprehend students’ participation in online learning environments.

With their widespread introduction in both higher and tertiary education, there is an urgent need to understand the pedagogic properties of online learning environments encapsulated for teachers. They represent new ways of interacting and new kinds of dialogicity that both teachers and students are being asked to enact. The kinds of conceptual frame provided by Burke permit an examination of the individuals, their engagement, interactions and the circumstances of those interactions. Without such an interdependent set of factors, the complexity of online learning pedagogic properties may not be comprehended.
2.6 Questions concerning educational technology

This need to understand the pedagogic properties of online learning environments raises questions about the assumptions being made in the absence of empirical data to support or refute their use. Many of the unexplored assumptions centre on the use of online learning environments. The assumptions likely arise from the understandings brought to teaching and learning as a didactic act. The effect of the kinds of assumptions made in teaching and learning is that many teachers accept uncritically the same processes in both face-to-face and online environments. The uncritical acceptance of processes emphasises the need to critically examine many of the assumptions through the use of a coherent model such as Burke’s (1969) Pentad. As argued in Section 2.3, Burke’s Pentad presents as a lucid model for understanding events, circumstances and activities. It allows the progression of the research towards the goal of describing, analysing and elaborating what is involved when we say what people are doing and why they are doing it, that is the effect of the environment on pedagogic processes. This is the question of motive raised by Burke (1969) and parallels the kind of questioning espoused by Heidegger (1977).

The research questions posed in this thesis have their genesis in the ideas of Heidegger (1977) and Burke (1969). Heidegger (1977) believes that understanding the essence of technology comes when an individual steps outside simply advocating, accepting or refusing technology. It provides a foundation for questioning the current belief system concerning online learning environments using technology, questions that may not be raised if we are advocating for, accepting of, or refusing to participate in, online learning environments. Burke (1969) provides a framework for analysing technological interventions in education from this foundation, that of critic of online learning environments. The irreducible tensions that result from attempts to apply Burke’s (1969) Pentad parallel Wertsch’s (1998) discussion of mediational means. Therefore, it is proposed here that understanding the pedagogic properties of online learning requires an accommodation of differentiated but irreducible relationships among setting (i.e. scene); learners and teachers (i.e. agents); individual’s personally motivated actions (i.e. agency); the purposes for interactions and activities (i.e. goals and purposes) and; the kinds of activities and interactions that are enacted (act) in attempting to secure all these relationships. While these might well be used to examine other pedagogic practices (e.g. classrooms), they have particular potency in the analysis
of online learning environments because they can elaborate the characteristics of those learning interactions and activities. This includes a capacity to engage dialogically and express the irreducible tensions, albeit in different degrees of relatedness, between social and individual agency that are manifested in these kinds of interactions.

In sum, the research questions for this investigation of online learning are

- What are the pedagogic properties of email discussion lists that influence students’ learning in those environments?

- What new understandings of pedagogic processes can be gained from a holistic analysis of email discussion lists such as provided by Burke’s (1969) Pentadic Schema, from using “different angles of analysis” (Rogoff, 1990, p26)?

In essence, to understand the pedagogic properties of online learning environments requires teachers, students and researchers to step outside the current roles of advocate, acceptor, or refuser and adopt the active position of critic. The non-acceptance of these roles may lead to a different form of understanding online learning environments, their physicality, potential and role in the future of education. Consequently, the irreducible tensions between Burke’s (1969) pentadic elements within an online learning environment may be explored.

Thus, judicious use of these different theoretical frameworks is employed to develop an awareness of the potential of interactions between individuals within mediated environments. Drawing on diverse theoretical frameworks is also an underlying concern of the methodology of the research that is discussed and justified in the next chapter.
3. Researching mediated learning

3.1 Research as mediational means

This dissertation draws on research traditions within the social sciences and views research methods and frameworks as ‘mediational means’; that is, methods and frameworks are viewed as processes through which sociocultural patterns and knowledge that both enable and constrain action within a research setting are produced (Wertsch, 1998). Three research perspectives are engaged, through a need to deploy both qualitative and quantitative methods, building on the strengths of each to augment the others.

The first perspective is the quasi-objectivist approach to observing behaviour; identifying patterns in the ways university students use online learning environments. However, simply identifying such patterns can result in loss of information about context and process (Dey, 1995). For this reason, a second and more interpretive perspective is also used. The interpretive approach adopts a more subjective stance, and provides contextualising features of the patterns observed in the quasi-objectivist approach. In this way, interpretivism offers some basis for understanding the students’ behaviour through interpreting patterns in context with educational theory. The third perspective uses the concept of ‘voice’ (Wertsch, 1998), in a particular form, to allow the students (participants) to express their understanding of the online learning environments they use at university. These three perspectives lead to a Heideggerian-type questioning – that is, stepping outside advocacy, acceptance, or refusal and investigating the essence of technology and its use in online learning environments. This chapter describes and justifies this approach to conducting the research, the analysis of findings and the premises upon which deductions can be made for these findings.

In teaching, there are guidelines for what teachers want students to do and achieve; the intended activities and outcomes. For instance, Chickering and Ehrmann (1997) outline seven principles for good practice in undergraduate education with respect to technology. These principles include basic guidelines for working with students. There are also guidelines for how we [teachers] want them to see what is provided for them. For instance, the notion of assessment and possible assessment items provides a range of ways for assessing how students have succeeded in
appropriating learning-related activities and materials. Thus, if ontology – the study of “issues of existence or being as such” (Guba and Lincoln, 1991, p159) – is “what we see” (Scheurich, 1997, 29), and epistemology – the study of the “origin, nature, and limits of human knowledge” (Guba and Lincoln, 1991, p159) – is “how we see” (Scheurich, 1997, p29) then pedagogy (curriculum or guidance for learning) could be defined as the epistemology of the (directed) ontology of students, or how students come to know what teachers want them to know. Put more simply, as teachers, the purpose of directing students in their learning is the goal of pedagogy. All this is in contrast to positivism which claims to mirror reality and whose epistemology “guarantee[s] or warrant[s]” the representation of reality (Scheurich, 1997, p29). In some branches of science, researchers use their methods unproblematically, accepting that what they see accurately reflects that at which they are looking (Ahern, 1999, Alasuutari, 1995). However, “even in the natural sciences, facts are always theory-laden because ‘something’ can only become a fact due to the theory that makes it recognizable [sic] as a fact” (Scheurich, 1997, p31). So, for instance, in this account, the methodology and the procedures are seen as problematic as they can only ever be partial (England, 1994), and are laden with the researcher’s values.

Gitlin and Russell (1994 p181) also challenge the objectivity of educational research which assumes “objectivity, validity, [and] reliability”. They do this by considering how the research context informs the methodology, and thus re-emphasising the relation between “structures, wider ideological assumptions, and method” (p181). Porter (1993 in (Ahern, 1999)) suggests that in these ways, an assumption of objectivity is made based on the researcher’s use of the third person. This means the researcher is written out of the account of the research, giving a pseudo-objective stance, thereby positing the research as outside and not related to the researcher. This supposedly reduces any unstated biases of the researcher, because the researcher is no longer present, and the results not ‘tainted’ by their views. However the method, its selection and enactment, are all subject to the researcher’s values and preferences, and objectivity is not guaranteed. Therefore, each selection of a method entails value judgements made by the researcher.

Chandler (1992) suggests that the adoption of theories in educational research, is generative of validity requirements that may not be appropriate for education. For instance, “defining educational research through these outside areas, for example, we
limit our research conceptualisations [sic] to individual behaviours [sic] (psychology), populations, such as schools (sociology), and groups such as classrooms (anthropology)” (p 128). The effects of this are a tentative correspondence between theory and findings. Attempts to understand educational phenomena are framed within theory that may not provide specific educational framing. Furthermore, Carr and Kemmis (1986) state that within an interpretive framework, an account must be coherent to be valid: it must comprehend and coordinate insights and evidence within a consistent framework. So it is not a case of ‘anything goes’, but an attempt to secure coherence for the research premised on its interpretive base. The conceptual framework sets the boundaries for the research in ways that are communicable to other researchers and maintains an educational focus. Merriam (1998 p218) suggests that reliability is “the extent to which there is consistency in the findings” which can be enhanced by explaining and relating it to “the assumptions and theory underlying the study”. This points to the limitations of uncritically adopting external standards for educational research that may not be applicable to educational problems, leading to a conclusion that assumptions need to be stated clearly at some point in the reporting process.

The methodology, in this case, provides a ‘consistent framework’ within which validity requirements can be met, as suggested by Carr and Kemmis (1986) above, while Merriam’s (1998) notion of explaining the assumptions and theory incorporated into the research provides an account of reliability. Thus the methods and processes described below frame the research both within and outside education, using theories that relate to both learning and research.

### 3.2 Case study methodology

The research is conducted within a case study framework, which according to Tellis (1997 online) satisfies the “three tenets of qualitative method: describing, understanding and explaining” a particular social phenomenon. Stake (2000, p444) describes a case as “something to be described and interpreted” and “something that functions, that operates; the study is the observation of operations”. However, this study builds a case on an integration of electronic data about student interactions on an email discussion list. The electronic data consists of quantitative data augmented by qualitative data that allows interrogation of the purposes of these interactions. The ‘cases’ comprise a number of online learning courses. The aims of this investigation are predominantly
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descriptive, with the intent to further understand the processes of interaction. A case study framework allows detailed analysis of this functioning using multiple data types elicited through multiple methods from multiple sources (Merriam, 1998, p204). The multiple data types comprise: (i) categorical variables such as enrolment status and gender of students, gathered from student records and from survey responses; (ii) textual data in the form of responses to open-ended questions in the survey; and (iii) the content of student and teaching staff email messages. The multiple methods comprising statistical analysis and textual analysis are described below. The sources of the data range from responses of individual students through to information from various recording systems (specifically student records and archives of email discussion lists). These result in multiple datasets that are integrated within the results and discussion.

Case study methodology has been characterised in various ways. Benbasat, Goldstein and Mead (1987) view case study methodology as being used primarily in exploratory studies. They note eleven characteristics of case studies (p371). These characteristics are listed in Table 3.1 together with authors who support and elaborate each characteristic. Nine of these eleven characteristics of case studies are strongly represented in the research design. Each characteristic is discussed below as it relates to this research project.

1. **Natural Setting.** The investigation took place in its natural setting, specifically, the activities were not influenced by the research and, with the exception of the survey, would have taken place without the research being conducted. The students were presumed to have interacted in their usual ways from their usual individual spaces (e.g. home, library and university computer lab). In some ways, the students were unaware of extra surveillance because as is noted below, the web-based archives comprising email discussion lists are freely available to be searched via the search tools on the Internet. “Scholarly” discussions of this kind are not “private” communication (Frankel and Siang, 1999, p12), and are viewable by anyone taking the time to subscribe to the discussion lists. Hence, it is possible to claim that the setting for the research was strongly natural.

2. **Data collected by multiple means.** The data was collected from student records containing student enrolment details; obtaining email messages from archives of discussions (auto-archived and collated by the Majordomo program), and by conducting a survey of students. Each of these methods of data collection provided a differing view
of the processes involved in facilitating learning via electronic mail. The strength of these multiple means is in their interweaving and cross-referencing.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Phenomena are examined in a natural setting</td>
<td>Benbasat et al. (1987), Driscoll and Dick (1999), Gillham (2000), Yin (1994)</td>
</tr>
<tr>
<td>3 One or few entities (person, group, organisation) are examined</td>
<td>Benbasat et al. (1987), Merriam (1998), Tellis (1997), Stake (2000)</td>
</tr>
<tr>
<td>4 The complexity of the unit is studied intensively</td>
<td>Benbasat et al. (1987), Merriam (1998), Tellis (1997), Stake (2000)</td>
</tr>
<tr>
<td>5 The research is directed at the exploration, classification and hypothesis development stages of the knowledge building process</td>
<td>Benbasat et al. (1987), Tellis (1997), Stake (2000), Yin (1994)</td>
</tr>
<tr>
<td>6 No experimental controls or manipulation are involved</td>
<td>Benbasat et al. (1987), Gillham (2000), Stake (2000), Yin (1994)</td>
</tr>
<tr>
<td>7 The investigator does not specify the set of independent and dependent variables in advance</td>
<td>Benbasat et al. (1987), Tellis (1997), Thomas (1994), Stake (2000)</td>
</tr>
<tr>
<td>8 The results derived depend heavily on the integrative powers of the investigator</td>
<td>Benbasat et al. (1987), Thomas (1994), Stake (2000), Yin (1994)</td>
</tr>
<tr>
<td>9 The research is addressing ‘why’ and ‘how’ questions rather than frequency or incidence</td>
<td>Benbasat et al. (1987), Driscoll and Dick (1999), Tellis (1997), Strauss and Corbin (1998)</td>
</tr>
<tr>
<td>10 Changes in site selection and data collection methods could take place as the investigator develops new hypotheses</td>
<td>Benbasat et al. (1987)</td>
</tr>
<tr>
<td>11 The focus is on contemporary events</td>
<td>Benbasat et al. (1987), Gillham (2000), Yin (1994)</td>
</tr>
</tbody>
</table>

Table 3.1 Characteristics of case study framework

3. **One or few entities examined.** The investigation/procedures focused on a ‘few’ entities, specifically four discussion lists, selected from ten (Study One) that were from similar courses within the one faculty. Criteria for selecting the discussion lists included:

- more than 100 participants in a similar field within related disciplines;
- introductory and advanced level courses; and
- permission to undertake the research from the course coordinator.

Thus, the four courses selected from Study One represent case studies that were used to examine online learning.
4. The complexity of the unit studied intensively. The complexities of the discussion lists were examined/investigated intensively, concentrating on the characteristics of the students, their activities and their perceptions. All aspects of the investigation contributed to the understanding of student participation in email discussion lists. In Chapter Five, this is contextualised within an analytical framework based on Burke’s (1969) Pentad.

5. The research is directed at exploration stages of the knowledge-building process. The current investigation explored the use of email discussion lists in large groups of students, an area which has not been extensively studied and which many researchers in the field of online learning predict will be unsuccessful (Turoff et al., 1999). Turoff et al. asserted that online courses with more than 50 participants would begin to break down due to large numbers of messages being shared. So, the cases studied here were used to explore the processes and consequences of online learning practices as a reasonably novel form of instruction in higher education.

6. No experimental controls. There was no experimental control or manipulation of the courses or students’ activities aside from the survey, as their conduct was unchanged by the research. As stated above, student interaction was uninfluenced by the research because the research design is descriptive and interpretive rather than experimental.

7. Dependency of Variables. Dependency among variables is explored through multiple data sets and data gathering methods. The variables are used to identify and to appraise possible indicators of successful discussion lists, in particular, student participation and engagement with online resources. Participation was measured in multiple ways. These included subscribing to the list and participation on the list as measured by the number of messages sent, as well as self-report within the survey.

8. Dependence on the integrative powers of the investigator. Findings deduced from the data were based on the interpretation of the data against the conceptual framework that by necessity included the capacity to understand the bases for student interactions in online instruction. This interpretation relied on an understanding of educational interaction synthesised within the context of Burke’s (1969) Pentadic elements.
9. ‘How’ and ‘why’ questions. Specifically, the research investigated the question of ‘how students use email discussion lists’ with an emphasis on ‘why’ they use them. Both of these concerns are privileged in Burke’s (1969) Pentad, albeit with different emphases. Understanding how and why students in higher education use email discussion lists as part of their online learning is a primary aim of the investigation.

The remaining two characteristics of the case study framework (Table 3.1) are partially applicable to the present investigation. The earlier findings, particularly monitoring of courses to determine participation rates from Study One, influenced the focus of the continuing investigation – the analysis of messages (Study Two) and the students to be surveyed (Study Three). Finally, the focus is semi-contemporary in that data was collected during the term under investigation although more was collected subsequent to it.

Case study methodology has been selected for this investigation because it allows concentration on the specific and multiple aspects of discussion list processes. In effect, this permits key questions about students’ participation in online learning arrangements to be answered. These include: (i) the rate at which students participate; (ii), how they participate, particularly what activities they engage in during use of the discussion lists; and (iii) what they gain – their perceptions of whether involvement in a list is worthwhile. These three aspects are investigated through analysis of

- the demographics of the total student population enrolled in the courses and those students subscribing to the lists (Study One);
- an analysis of activities on the discussion list through investigation of online activities (Study Two); and
- surveyed students’ perception of the use of email discussion lists (Study Three).

These three interrelated studies are described in detail below.

### 3.3 Interpretive framework and constraints

The theoretical framework for interpreting results from the case study focuses on the use of dramatistic analysis derived from Burke’s (1969) Pentad. As discussed in Chapter Two, this framework allows attention on the act being undertaken, the scene
where the act occurs, the agent responsible for the act, the agency through which the agent engages in the act, and the purpose for which the agent engages in the act.

As Burke notes, “both act and agent require scenes that ‘contain’ them” (p15). In this way, both act and agent can be partially defined by their presence in the scene. This is precisely the case in a virtual environment where an agent’s presence is only evident in the messages they send. The only apparent agents seen in the scene are those engaged in one specific act, namely sending a message. Those agents whose method of interaction is vicarious (Hatano and Inagaki, 1991, Sutton, 2001), that is, whose interaction is nodding or shaking their heads (Hatano and Inagaki, 1991) or simply observing the interaction between others (Sutton, 2001) in the face-to-face situation, are not accounted for by measurements of the particular type of act that assist in defining the scene. In this research, that particular act could comprise sending an email message to the discussion list. Another act, which places the agent in the scene and that is common to both visible and vicarious actors, is subscribing to the list. The distinction between forms of act that put the agent in the scene is necessary for a full analysis of the scene. Burke (1969 p16) notes the indeterminate nature of using an interaction (ratio) between the agent and the act in the following way

The scene-act and scene-agent ratios are in the fullest sense positive (or ‘positional’). But the relation between act and agent is not quite the same. The agent does not “contain” the act, though its results might be said to ‘pre-exist virtually’ within him. And the act does not ‘synecdochically share’ in the agent, though certain ways of acting may be said to induce corresponding moods or traits of character.

However, the two dominant forms of act, subscribing and participating, require attention, because the scene of an online environment is populated by students some of whom perform visible acts, the remainder of whom become effectively invisible to the main agents (i.e. other participating students and teachers). These acts cannot ‘stand for’ the agent because not all agents perform the same acts (however defined – see section 3.4.2) and not all acts result in the same effect in the scene. The scene, defined as the discussion list, pays attention to both primary acts (i.e. subscribing and participating). For the individual agent, however, this scene is not manifested as a physical environment, but is brought forth in the interface, at the screenface of the computer. Both reading messages and sending messages to a discussion list are enacted at the screenface, the transparent boundary between the real and the virtual (online) environments, at the screenface as postulated in Chapter One (Section 1.3). The act
with the greatest measurable effect – participating by sending a message – is preceded by the reading of messages, the less obvious of these primary acts. The data collected embodies evidence from the virtual; traces left of the student agent’s presence in the scene. For instance, each message is a representation of an agent’s (both teacher’s and student’s) presence in the scene.

### 3.4 Procedures for data collection and analysis

The university is located in a provincial city in a state on the east coast of Australia. The university has a relatively long tradition of providing distance-based higher education and commenced distance education at the time when the then federal Department of Employment, Education and Training favoured limiting the number of universities in each state and nationally that were funded to provide distance education (Dawkins, 1988). So it has a relatively long history of providing higher education to students who are remote from the campus, yet also has a large body of on-campus students. Its forays into the electronic provision of higher education provisions build upon this distance education provision.

This research consisted of extracting student demographic data from student records, analysing of the content and frequency of messages, and a survey of students, all stored electronically. Thus, to understand an online environment, three broad research areas of inquiry need to be explored focusing on: (i) who is participating; (ii), what are they doing; and (iii), how they conceptualise and value the use of online learning environments. Taken together, these areas of inquiry provide a more complete picture of students using online environments than if each question was analysed independently.

Questions about who participates focused on the characteristics of the group under investigation and required quantitative data collected from student records. The data was summarised to give both general and specific information about the group of students. This formed the basis for Study One.

Questions concerning students’ participation require observation of what the cohort of students was doing. Participant observation is the traditional method of obtaining such data and ranges from complete participant to complete observer. The present research study falls closer to the ‘complete observer’ end of the spectrum,
because the participants were generally unaware of the researcher. These observations formed the basis of Study Two.

Questions about what individuals think about specific environments required eliciting responses from students which explore their perceptions. This was undertaken in Study Three through a survey of student participants.

Courses (i.e. an individual subject or unit of study in a degree program) for investigation in the inquiry were initially selected on the basis of enrolments the previous year. Twenty-five courses matched the requirement of greater than 100 students enrolled, of which twelve were selected within one semester due to time and cost limitations. Courses with large numbers of students were selected in order to investigate some assumptions of discussion list usage, for instance that large groups (greater than 50 participants) would be unsuccessful (Turoff et al., 1999). These courses comprised both introductory courses, that is those undertaken in the first year – novice level, and advanced courses, those taken in second and subsequent years and generally requiring completion of introductory level courses. The purpose here was to identify, if possible, differences in participation between advanced and introductory courses. The courses included mathematics, programming, database development, information technology and multimedia. The overall teaching arrangements for these courses were quite homogenous. Each of these courses had a course profile, which described for the student the requirements for participation in the course and assisted students in framing their studies. The profile included information on weekly activities, assessment items, discussion list subscription and course coordinators. In this way, comparisons across the courses in terms of student participation were largely free from variables arising from differences in extraneous components of the courses.

Coordinators for these twelve courses were approached for permission to monitor each course during the semester and for assistance in data collection (see Appendix 8.1 for email sent to course coordinators). The coordinators were specifically asked to provide permission to collect information regarding their class email lists. Permission ranged from offers to send the information after being collected to carte blanche permission to be involved in the list. Where possible, the procedure adopted was to subscribe to each list once a week, request a list of subscribers then unsubscribe from the list. This procedure minimised the amount of email received from full participation (subscription) to the lists. In other instances, the course coordinator supplied the
number of email addresses subscribed. Collection of full lists was preferable, although one of the courses was surveyed by the coordinator of that course. Hence, information from 10 courses was available for analysis and included some of the largest courses (i.e. in terms of enrolments) and some of the busiest lists (i.e. in terms of volume of email). Section 3.4.1 discusses the process of selecting the four courses.

3.4.1 Study One – Selecting courses

Study One focused on an analysis of data about the students, courses and students’ participation in the online learning method. Monitoring data on the courses allowed for determination of activity levels within the courses. This focused primarily on subscription and participation rates. Subscription specifically relates to the act of subscribing an email address to a list via the Majordomo program, that is, the students entering the scene. The rate at which students subscribe to and become involved with online learning environments has been a contentious issue (Althaus, 1997). Althaus (1997) explored a number of possible contributory factors for participation including gender, age and prior experience with computers and email. This investigation does not seek to answer the question of why students become involved, but rather to further the appreciation of the role of the online environment in the potential learning repertoire of the student. As noted in Chapter One, the ‘barriers’ research focus does not elicit understanding of the kinds of learning opportunities afforded by technological interventions.

Subscription to the Majordomo list servers in these courses is accomplished by the students, rather than any action on the part of the course coordinator, faculty or university. Thus, subscription is voluntary rather than a result of enrolment in a given course. Participation is the act of sending an email to the list, which can only be accomplished after subscribing to the list. Both subscription and participation allow some judgements to be advanced about the level of activity of a discussion list, and they provide measures of the lists’ success as a learning environment. A list with a large proportion of the enrolled students subscribed and which also has many messages posted is defined as being more successful. This is because measures of activity, such as number of messages per student, are higher and thus encourage interaction between participants. Conversely, a list with a small proportion of enrolled students subscribed and few messages posted is less successful due to a lack of activity and subsequent learning opportunities. Subscription and participation provided the two dimensions for
allowing selection of lists for in-depth investigation based on this simple perception of success – high and low subscription rates, and high and low participation levels.

Table 3.2 presents these two dimensions – volume of messages presented across the top of the Table, and proportion of enrolled students subscribing presented down the side of the Table. Thus the relationship between the four categories used for the research could be depicted. These categories relate to lists that have: (i) a high volume of messages from a large proportion of students; (ii) a high volume of messages from a small proportion of students; (iii) a low volume of messages from a high proportion of students; and (iv) a low volume of messages from a low proportion of students. Thus the activity level defined by subscribing and participating provides a range of examples of how the lists can be used. These categories provide a basis for comparison among lists of very different forms and processes. Lists in which many students are subscribed and involved may provide a very different scene from those where there are few subscribers and participants. These different manifestations of lists enable the elucidation of pedagogic processes that either promote interaction or potentially stifle it. However, it is acknowledged that there will be different kinds of participation by students who subscribe to these lists.

<table>
<thead>
<tr>
<th>High number of messages</th>
<th>Low number of messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>High proportion of subscribers</td>
<td>(i) High volume High subscription</td>
</tr>
<tr>
<td>Low proportion of subscribers</td>
<td>(ii) High volume Low subscription</td>
</tr>
</tbody>
</table>

Table 3.2 Categories for selecting lists and names of categories

The collection of data to describe the list processes was from two key sources: (i) the Majordomo program, and (ii) student records which contained extensive descriptive variables concerning each student. The Majordomo program (Chapman, 1992) contains a list of all subscribers and archives all messages sent to the list. This program allows the sending of messages to a single address that incorporates all subscribers. The data collected from the Majordomo program was used to link quantitative data on levels of participation with qualitative data about the kinds of participation.

The messages derived from the archive collected by the Majordomo program permitted identification of: (i) the time and date of sending messages, and (ii) the
participants’ identity and thus (iii) their gender and enrolment status. Student enrolment data added the descriptors of enrolment mode (i.e. full- or part-time), enrolment status (i.e. internal or external), campus, gender and grade. This allowed for an analysis of these variables that provided a description of both all enrolled students, subscribers (e.g. peripheral participants – lurkers/browsers) and participants. It also indicated which subscribers were members of the teaching team. This data was analysed using SPSS statistical software.

3.4.2 Study Two – Analysis of activity

Study Two focused primarily on participants, that is those students who actually sent a message to the list, as well as peripheral participants, students whose participation was vicarious and thus peripheral to the workings of the list. The primary source of data for analysis of activity was the archived messages from Majordomo. The Majordomo program acts as a distributor for messages sent to the discussion list. Upon receipt of a message, the program sends that message to all subscribers. Within the courses under investigation, the Majordomo program was set to allow only messages from subscribers to be forwarded. This setting provided some reduction in off-topic and spam (superfluous) messages. All messages received by the Majordomo program were archived into monthly files. A web archiving tool was also subscribed to the lists, allowing for the elimination of non-subscriber material from the Majordomo archives. This included messages sent by bulk mailers rather than those sent by subscribed students or teachers.

Each archive contained multiple files, each of which accounted for one calendar month of email messages. Files were available for the four-month period that comprised the duration of the semester. A further month was added to collect and compile late messages. The file for each month was edited to remove routing information, keeping only that information which related to time, date, subject, and sender, the body of the message and any signature appended. Hypertext mark-up language (HTML) information was also deleted to allow easier reading, whilst keeping the original content of the message in plain text. Appendix 8.2 contains an example of an edited email and its precursor, which has been edited, removing reference to the individual, the course and other individuals to ensure confidentiality of participants. This editing allowed for ease of reading the archives and minimised further editing before analysis. The archives were analysed in three ways: (i) header information, that
is information about the sender, time and date of sending, and subject; (ii) analysis of content, that is the purpose of the message; and (iii) the relation of each message to other messages (conversation structure).

Header analyses provided a simple analysis of ‘who’ sent messages, for ‘what’ purpose and ‘when’ messages were sent, thereby providing the key information regarding ‘participants’. When combined with the list of subscribers, this allowed for the determination of both non-subscribers (students enrolled but not subscribed), and non-participants or ‘lurkers’ (students who subscribed, but did not post messages). This analysis was used to indicate the level of activity (act), who was participating (agent) and when (scene).

Archive analysis provided a full textual record of messages sent to the list. These files, which were recorded by calendar month, were organised into a weekly set of messages to allow analysis to proceed based on one key feature of the courses, weekly divisions of material. These weekly files were analysed using NVivo, a software program for the analysis of textual data (QSR International, 2000). NVivo allowed for the grouping of characteristics under various categories (called ‘codes’ by the program).

In the first analysis, the files were arranged to allow analysis of who (agent) sent the messages (act). Each message was grouped under a category of ‘staff’ or ‘student’ then by the first name of the individual. Names were used within the program to allow all messages by a single individual to be identified. Reporting of the emails from individuals within the following chapters take the form of presenting and discussing results by general characteristics (e.g. student, course name) to avoid identification of students.

A second analysis of the data allowed for grouping by the purpose of the message (act), for instance ‘questioning’, ‘responding’ and ‘informing’, thanks and humour where these were the sole purpose of the message. These categories are based loosely on an analysis of message flow and message function. Message flow analysis allows for determining who sends a message, who the message is addressed to, and who replies to that message (See Harris and Jones, 1999). An alternate name for message flow analysis would be message thread analysis. Message function, according to Harris and Jones (1999) can be divided into a number of categories such as reporting information, requesting information and other functions (see Table 3.3 below).
### Table 3.3. Categories of Message function (after Harris and Jones, 1999)

<table>
<thead>
<tr>
<th>Reporting information</th>
<th>Content information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Procedural information (content-related &quot;how-to&quot; information)</td>
</tr>
<tr>
<td></td>
<td>General information</td>
</tr>
<tr>
<td></td>
<td>Directions (non-content-related &quot;how-to&quot; information)</td>
</tr>
<tr>
<td></td>
<td>Personal information</td>
</tr>
<tr>
<td></td>
<td>Idea/opinion/emotion</td>
</tr>
<tr>
<td></td>
<td>Resource (book, video, or other resource information)</td>
</tr>
<tr>
<td></td>
<td>Feedback (non-content-related suggestions, evaluations, etc.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Requesting information</th>
<th>Content</th>
<th>Procedural Information (content-related &quot;how-to&quot; information)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Directions (non-content-related &quot;how-to&quot; information)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Personal information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Idea/opinion/emotion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resource (book, video, or other resource information)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feedback (non-content-related suggestions, evaluations, etc.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other functions</th>
<th>Salutations (greetings and closing, not including signatures)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Planning (project planning)</td>
</tr>
<tr>
<td></td>
<td>Thanking</td>
</tr>
<tr>
<td></td>
<td>Complaining</td>
</tr>
<tr>
<td></td>
<td>Apology</td>
</tr>
</tbody>
</table>

Each of these categories can be used to indicate the kind of dialogue or discourse being enacted within the e-mail discussion list. Understanding of these kinds of discourse allows instructional design to account for different styles of student learning. These categories were synthesised from an initial review of the data and based on Piburn and Middleton’s (1998) categories. These categories were synthesised from an initial review of the data and based on Piburn and Middleton’s (1998) categories. Table 3.4 contains all the categories used to classify messages with a brief definition of each category. Subsequently, questions and responses were grouped according to the type (purpose).
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<table>
<thead>
<tr>
<th>Category</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questioning</td>
<td>Any message which contains a question</td>
</tr>
<tr>
<td>Responding</td>
<td>Any message in response to another message, with the exception of those specifically asking a question</td>
</tr>
<tr>
<td>Observing</td>
<td>Comments, generally by students that address issues such as ‘there is a mistake in the study guide’</td>
</tr>
<tr>
<td>Informing</td>
<td>Comments, generally by teaching staff, which address issues such as descriptions of exams</td>
</tr>
<tr>
<td>Testing</td>
<td>Messages that are testing a subscription, a filter or any other aspect of email use</td>
</tr>
<tr>
<td>Humour</td>
<td>Jokes and generally humorous comments with no other function such as ‘&lt;grin&gt;’</td>
</tr>
<tr>
<td>Repeat</td>
<td>Messages that have been posted before either accidentally or purposefully</td>
</tr>
<tr>
<td>Thanking</td>
<td>Messages that specifically thank others and have no other purpose</td>
</tr>
<tr>
<td>Error</td>
<td>Message sent to the wrong address such as the wrong list or for Majordomo, not the list</td>
</tr>
<tr>
<td>Forwarded</td>
<td>Messages forwarded by one participant for another</td>
</tr>
<tr>
<td>Flame</td>
<td>Messages that have no other intent but to scold another member</td>
</tr>
</tbody>
</table>

Table 3.4 Categories of purpose defined messages

Types of questions and responses were grouped according to the following categories: ‘content’, ‘assessment’, ‘networking’, ‘study’, ‘list’, ‘non-content’ (see Table 3.5). Content referred to the actual objectives of the course, while assessment referred to the assignments, exams and submission details. Networking focused on student-to-student contact, for instance formation of study groups; study dealt with clarification of requirements for studying the content (i.e. which chapter of the textbook/study guide deals with what topic) while list dealt with problems associated with list functioning and management. Non-content referred to processes involved in computer set-up and other activities supplementary to learning.

<table>
<thead>
<tr>
<th>Content</th>
<th>Concerns the content of the course, relates directly to the learning objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Networking</td>
<td>Refers to formation of study groups and activities that bring students together</td>
</tr>
<tr>
<td>Assessment</td>
<td>Refers directly to the assessable items (assignments, exams etc)</td>
</tr>
<tr>
<td>Non-content</td>
<td>Refers to issues to do with computers and their usage, not directly relevant to content.</td>
</tr>
<tr>
<td>Study</td>
<td>Concerns the actual information to be studied, where to find it</td>
</tr>
<tr>
<td>List</td>
<td>Refers to the operation of the list, problems</td>
</tr>
<tr>
<td>Clarification</td>
<td>Seeks clarification of some topic</td>
</tr>
<tr>
<td>Tips</td>
<td>Hints on where to find information and other handy hints</td>
</tr>
<tr>
<td>Confirmation</td>
<td>Confirms some aspect previously discussed</td>
</tr>
</tbody>
</table>

Table 3.5 Subcategories of questioning and responding

Groups dynamics, that is the acknowledgement processes inherent in group activities, was also analysed (agency). This included the number of participants using a
salutation (e.g. ‘Hi’) and a closing statement (e.g. ‘regards, Alison’) in the email message. These parts of messages may demonstrate a sense of collegiality and congeniality and could indicate a sense of the ‘group’ involved within the list. This is an area that has not attracted much research and may contribute to an understanding of the ways in which groups interact within online environments.

While this analysis gave an overall view of the lists, specific activities were not analysed. A third analysis dealt with ‘conversation’, that is, specific answer-response threads within the archived messages. In this analysis, the messages analysed were those that followed a logical progression of an idea, in effect a student-tutor nested dialogue or tutoring path (Tsinakos and Margaritis, 2001), particularly concepts being taught within the course. In this respect, a small number of emails were potentially part of more than one ‘conversation’, as new ideas were added and developed and questioned by other students.

The purpose of gathering together these ‘conversations’ was to follow the development of understanding by students. Many of these interactions took place between a single student and a member of the teaching team or with another student. Others included multiple responses as students offered their interpretation in addition to that of the tutor. This analysis provided a convergence of agency, act, agent and purpose, allowing useful insights into the processes involved in list participation.

This final layer of analysis comes under the designation of conversation analysis. Fahy, Crawford and Ally (2001) outlined a number of structural features of online conferences, including network size, density and intensity. The main feature that will be discussed here is intensity, as both network size and density assume compulsory participation. In a voluntary forum, such as is under investigation here, the values for network size (i.e. the potential person-to-person links) are extremely large and density (i.e. the ratio of actual links to the total potential links (Fahy et al., 2001)) is skewed due to a large proportion of students ‘lurking’. ‘Density’ as suggested by Fahy et al. (2001), is the ‘dutiful’ checking in of participants with other members of the list creating numerous potential interactions. ‘Intensity’, that is the ‘depth and persistence of the interaction’ between and among participants (Fahy et al., 2001), is the main focus of the discussion in Chapter Five. Depth of interaction is indicated by the number of posts in a sequential ‘thread’ of a discussion, while persistence (or length) is the total number of postings on that topic. As threads may branch with multiple responses at any given
level (depth) in the discussion, depth and persistence measure two aspects of interaction. Figure 3.1 shows the different aspects of interaction with the maximum number of messages in a continuous sequence (depth) as three, while the total number of messages in the conversation (i.e. six) represents the length. Depth is the number of messages in a straight line (e.g., message, response, response, response etc.), while length is the total number of messages on a topic. Differences in depth are due to multiple responses to a previous message.

![Figure 3.1 Depth and length of a hypothetical conversation (depth = 3, length = 6)](image)

The interactions were analysed for evidence of specific strategies which are applied in face-to-face situations and which are known to assist learning. Each aspect of the analysis allowed a deeper understanding of the interactions produced in using email.

**3.4.3 Study Three – Survey**

The third study comprised surveying students involved in the discussion lists. Courses selected for survey were the same four selected for in-depth analysis in Study Two and included one from each category as described in Table 3.1. The survey identified a variety of characteristics including individual attitudes toward technology, communication and email. This instrument (described below) was designed based on survey instruments from previous studies (Golladay, Copeland and Wu, 1998, Hancock and Flowers, 2001, Lazar and Preece, 1999, Mavis and Brocato, 1998, Ranchhod and Zhou, 2001, Sheehan and Hoy, 1999) and can be found in Appendix 8.3.

Students surveyed were those who had subscribed to the list for at least six of the twelve teaching weeks, generally the last half of the semester. This was because students unsubscribing in the first weeks were generally those who had withdrawn from
the course and were unlikely to respond to questions relating to the use of a list within a course in which they were no longer enrolled. Reasons for student withdrawal are beyond the scope of this research, therefore these students were excluded from the analysis. This allowed a focus on students who could be assumed to be ‘motivated’ to participate and whose use of the lists was ongoing. This provided more than 600 email addresses to be surveyed across the four courses.

The survey was conducted after the end of the term under investigation. It was timed to coincide with the university mid-term break during the subsequent term to take advantage of potential reduction in student workload during this period. The students were allowed adequate time for response and the last responses were received after the end of the term following the examination period.

The survey comprised four parts. Section 1 required students to answer questions about themselves. Most questions were closed in order to elicit a specific response, although for each question there was opportunity to add a category not included in the options. Section 1 questions were specifically aimed at gaining self-reported demographic information regarding students’ background. Items included: age; course enrolled in; gender; access to computers; campus and enrolment details (i.e. mode – internal versus external and status – full-time or part-time). Also, information was gathered on the students’ employment to determine whether professional work influenced email use, and the number of email addresses each student used. The latter process assisted in cross matching student records and determined a level of confidence with the technology based on the assumption that the more email addresses used by a student, the more confident a student would be with the technology. This is supported by anecdotal evidence that the researcher gained from working with students in information technology over a period of five years.

Section 2 comprised questions regarding student use of email discussion lists. These questions sought information regarding frequency of use as well as open-ended questions regarding type of use. Questions asked, for each list subscribed, whether students posted messages, read messages and whether they found these messages useful. Other information gathered included student perception of email discussion lists. These questions requested students respond on the most valuable and least valuable aspects of lists as well as to provide a description of email lists.
Section 3 contained questions regarding communication anxiety. Survey instruments were gathered from the literature (Jones and Paolucci, 1999, McInerney, Marsh and McInerney, 1999, Mitra, Hazen, LaFrance and Rogan, 1999, Pugalee and Robinson, 1998, Worthington and Zhao, 1999) concerning both communication apprehension and computer anxiety. Computer anxiety was not analysed as the students were in IT-related courses, which suggests computer anxiety would not be a factor.

Thus, Section 3 contained closed questions relating to communication anxiety (listed below 1–10). These items were taken from the short form of the ‘Personal Report of Communication Apprehension’ (PRCAS) (McCroskey, 1978). The PRCAS was chosen as it allowed investigation of the belief that these students (computer majors) were possibly communication apprehensive. This is a reflection of the image of the ‘nerd’ – the computer hacker – as isolated, single-minded and focused (Bernstein, 1999, Wilson, 1995). To this were added five similar questions regarding email discussion lists to cross-reference with both communication anxiety and reports of participation (listed below 11–15). This, in part, allows an analysis of whether students who are apprehensive about communication have negative feelings towards email discussion lists. The final items which used a 5-point rating scale are:

1. I look forward to expressing myself at meetings.
2. I am afraid to express myself in a group.
3. I look forward to an opportunity to speak in public.
4. Although I talk fluently with friends, I am at a loss for words on the platform.
5. I always avoid speaking in public if possible.
6. I feel that I am more fluent when talking to people than most other people are.
7. I like to get involved in group discussion.
8. I dislike to use my body and voice expressively.
9. I’m afraid to speak up in conversations.
10. I would enjoy presenting a speech on a local television show.
11. I enjoy sending emails to friends.
12. I enjoy reading emails from friends.
13. I dislike reading emails from the email discussion lists.
14. I would encourage fellow students to use email discussion lists.
15. Email discussion lists are very important to my studies.

The final part of the survey (Section 4) was a consent form. Students were asked to insert their student number in place of their signature to indicate their understanding of the survey and their consent for their responses to be used in the research. The survey instrument is contained in Appendix 8.3.
In order to pilot the survey, it was sent initially to staff members of the faculty as potential users of the results from the survey. As described by Dillman (1978), potential users of the data invariably provide feedback not available from other people. Staff members were asked to follow Dillman’s suggestions for a pre-test of the survey:

- Are all the questions easily understood?
- Are there any possible misinterpretations of questions?
- Do all close-ended questions cover all possibilities?
- Does the questionnaire create a positive impression, one that motivates people to answer it?
- Does any aspect of the questionnaire suggest bias on the part of the researcher?

(From Dillman, 1978 p156)

The responses from staff provided helpful input, including the identification and resolution of any perceived difficulties. Responses to this ‘pilot’ investigation allowed for minor adjustments to some questions. Some staff members were also previous students and provided feedback from the perspective of student as to the clarity of the questions.

Incentive for students to participate was provided in the way of a raffle of gift vouchers. Students responding to the survey were entered into the draw, providing a tangible incentive (Dillman, 1978; Ranchhod and Zhou, 2001) but not in a way that would influence the data provided.

3.4.3.1 Administration of survey

The initial solicitation email was sent to 676 identified student addresses during the mid-semester break following the semester under investigation. Of these, 38 proved to be invalid due to a variety of reasons, such as unknown user (e.g. the user has changed ISP), user over quota or other ‘fatal’ errors. The remaining 638 addresses received the initial email.

As the initial email contained the web address for the survey reproduced online, some students immediately replied via this web-based survey (WBS). Over the next week, 27 students responded to the initial email using the WBS, although one response
was invalid as the respondent failed to complete the consent form. Four students declined to be involved. Email addresses of students responding (either with a completed survey or a request not to be included) were removed from subsequent postings of the survey reminders.

The survey document was sent a week later to the remaining 607 addresses. Only one student declined to be involved at this time. In the 48 hours following this, a further 43 responses were received both via WBS and the email-based survey (EBS). Some of these responses showed that multiple addresses were owned by individual students indicating that while 676 addresses were canvassed, the number of students could not be determined unless all students responded. A total of 86 responses were received prior to the reminder being sent.

A reminder was sent one month later to 533 addresses. Of these, 17 addresses were no longer valid. This resulted in a further 22 responses and 35 students declined to be involved. The final reminder was sent after exams, approximately two months after the initial email, resulting in a further 23 responses and 5 students declining. A total of 129 valid responses were received, 46 students declined to be involved and 68 addresses were invalid. A summary of the responses from students is provided in Table 3.6.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Address</th>
<th>Responses</th>
<th>Invalid</th>
<th>Remove</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solicitation email</td>
<td>676</td>
<td>0</td>
<td>38</td>
<td>0</td>
<td>38</td>
</tr>
<tr>
<td>Initial email</td>
<td>638</td>
<td>26</td>
<td>0</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>Survey</td>
<td>607</td>
<td>60</td>
<td>1</td>
<td>2</td>
<td>63</td>
</tr>
<tr>
<td>First reminder</td>
<td>544</td>
<td>21</td>
<td>17</td>
<td>35</td>
<td>73</td>
</tr>
<tr>
<td>Last reminder</td>
<td>471</td>
<td>22</td>
<td>12</td>
<td>5</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td>129</td>
<td>68</td>
<td>46</td>
<td>243</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.6 Summary of administration of survey

This gave a return rate (i.e. students replying to the survey or declining to participate) of approximately 28 percent and a positive response (i.e. completed surveys) rate of 21 percent. Reported return rates for email surveys in university settings vary from 6 percent (Ranchhod and Zhou, 2001) to 67 percent (Mavis and Brocato, 1998). Mavis and Brocato compare traditional postal with email surveys and report previous studies showing return rates ranging from 28 percent to 83 percent. Sheehan and Hoy (1999), in a survey of research methods using email report response rates for email surveys of 6 percent to 75 percent. Mavis and Brocato (1998) conclude that postal surveys are superior to email surveys in terms of response rates, while
Sheehan and Hoy (1999 online) conclude email surveying would never replace the “broad-based data available via postal mail surveys”. Given these findings, a response rate of 21 percent is deemed adequate for the purpose of investigating the value of email discussion lists for students in learning situations.

Given that the survey was only one facet of the research, the response rate does not reduce the value of the comments made by those students who responded. Paccagnella (1997) cautions using online methods to obtain information concerning “someone’s off-line life”. However, in this instance the information sought is with regard to online activities although the same caveat applies. Survey data was analysed quantitatively for the descriptors using SPPS, and qualitatively for the open-ended question using NVivo.

### 3.5 Summary of data collection

Table 3.7 shows the ways in which the data addresses the issues raised in Chapter Two. The course profile and web pages, which were used to gain familiarity with the courses, provide information concerning the scene. They provide information about how the discussion list will be used, information about the processes involved in learning within the course, as well as how mediation will be undertaken. Also, they indicate the kinds of interactions that are appropriate in the course discussion list.

Data gathered from student records in Study One provide extensive information regarding the agents. The dataset included details of their enrolment, their age, gender and other descriptor. This set of data was collected by the university for its administrative purposes. It provided the descriptors of the agent and related to the interactions between students (who is participating). Intersubjectivity is hinted at by the analysis of the characteristics of the students through possible connections being made with other students. Thus, intersubjectivity was seen to arise from the ways in which students participate. This was further defined and investigated by other parts of the research.
Table 3.7 Data sources as related to Burke’s Pentadic Elements and concerns from Chapter Two

The Majordomo archives, providing the mail headers and the content of the messages, were the key data source for Study Two. The headers provide information concerning the agent and the scene. The header contains the sender’s identity, the content of the message (i.e. through the subject field) and the time of sending. This relates to the nature of interactions through the agent’s participation (e.g. frequency of interactions) as well as the subject of the message and subsequent responses. This latter aspect, the subject field of an email, provides the initial indication of the potential for intersubjectivity, particularly in relation to the ways in which students respond to messages. The mediation by the scene of the discussion list is also evident in aspects of the mail headers. The genre of the mediation becomes evident through the subject, which is used to establish ‘conversations’ as described above.

The message body provided details of how students interact. The initial analysis elicited information about the student (agent), their purpose, and their acts. This provided insight into the interactions and structured processes within the learning environment (scene). It secured details of the forms of mediated speech and the nature and forms of mediation as it relates to dialogue and genre. Immediacy and
intersubjectivity are processes that become evident through this analysis and their relationship to the Zone of Proximal Development and epistemic authenticity.

Finally, the survey provided information concerning the student, the agency of the student as well as the acts that they performed. These acts identify further information about the interactions undertaken by students, how they mediate their learning and the immediacy that this mediation provides.

The above description of the research allows a contribution to an overall picture of the use of email discussion lists in large groups within scholarly environments. This research will weave together the responses from students (survey data) with their experiences (from the archives) within the framework of sociocultural theory. In this way, a theoretical understanding of students’ experiences will be generated. It will examine how Burke’s (1969) Pentad can be applied to result in a thorough analysis and pay particular attention to the emergence of the ‘screenface’ as a description of the online learning environment.

3.6 Ethical considerations

Approval was sought for the research and, in particular, the survey under the university guidelines for the ethical conduct of research. Student confidentiality was assured and student identity shielded and de-identified. However, the information sought was unlikely to result in ‘negative sequelae’, that is, there was minimal impact and chance of misunderstanding in both the content and the conduct of the survey (see Appendix 8.4 Ethical Clearance).

Student identification numbers were collected to ensure that each student answering the survey questions was indeed enrolled in one of the surveyed courses, as well as identifying which course. This information was not recorded in any form other than the original completed survey document.

Students were not identified by name, email alias or email address. Participants were identified in a sequential manner by number. Pseudonyms were not used in order to minimise potential identification (e.g. gender). Gender was only identified where this provided additional insight into student behaviour.

Frankel and Siang (1999) highlight the difficulty in gaining informed consent on the Internet, due to blurring of the boundary between public and private domains and
the ability of users to be anonymous or ‘pseudonymous’. As this survey was directed solely at students, the survey contained a request to provide the student number in place of their signature in the survey, indicating their consent. Student number was checked against a list of students enrolled in the courses surveyed and deleted from the subsequently saved text files.

The archive analysis was not expected to cause any ethical problems, as scholarly email discussions are considered to be low in perceived privacy in online communication (Frankel and Siang, 1999) and students are aware of the public nature of the web-based archives. In the following chapters, students remain anonymous throughout the discussion of participation.

3.7 Strengths and limitations of design

The research design attempts to gain a wide range of data from many sources in order to provide a greater understanding of how students engage in an online learning environment. Specific information from students is merged with records of their enrolment and activities undertaken within the scene of their involvement. The student cohorts being investigated are large and, hence, aim to provide broadly representative perspectives of online learning. The research seeks to examine the ‘top-down’ push towards online learning environments as potentially serving more students with fewer resources. The student cohort is made up of students whose competence and engagement with technology is high, because they are in information technology courses, thus providing insight into levels of mastery and appropriation of technology.

The strengths of the research arise from the triangulation of data from enrolments, collected messages and student responses to the survey, and from the rich data provided by the messages. The three studies provide different lenses through which to view the activities being undertaken within the investigation.

However, the survey provided information concerning a limited cohort in which a particular kind of student was involved. These students were taken as being likely to be particularly Internet ‘savvy’; being enrolled in information technology-related degrees. Further, the collection of data occurred during only one year. While a longitudinal investigation would provide the ongoing ‘sense-making’ activities of students, this would required data collection over an extended period. Student commitment to an
ongoing study of the depth required here could not be guaranteed. Thus, an in-depth analysis of multiple courses was obtained during a single semester.

The following chapters present the findings from the three studies described above. Chapter Four provides a rich description of the ten courses from Study One. This chapter is an overview of the ways in which the ten discussion lists are used. The variations among the ten courses lead to the selection of four for further analysis. Chapter Five provides the further analysis of the four discussion lists, particularly in terms of Burke’s (1969) pentadic elements. Each element is discussed with reference to these four course discussion lists.
Researching mediated learning
4. Constituting online learning environments

4.1 Online learning environments

Study One was designed to identify what constitutes the online learning environment of ten selected undergraduate university courses from which four would be selected for more detailed investigation (Study Two and Three) as reported in following two chapters. This chapter describes the ten courses for which data was collected, thus providing an overview of the potential of discussion lists used as non-mandated elements of participatory environments. In other words, the discussion lists are components of the courses that do not require participation for successful completion of the course because they do not contribute to the participant’s final grade. The initial ten courses were analysed to select four courses that would most effectively reflect variations in the acceptance and use of online learning environments. The analysis deploys Burke’s (1969) pentadic elements of scene, agent and act in a preliminary analysis that pre-empts the more detailed analysis of the elements in Chapter Five. In both analyses of what constitutes the online learning environment, the elements scene, act, agent, agency, and purpose become central to the descriptions and discussions.

Descriptions of student populations (agents) provide a (scenic) basis for further analyses. These are then combined with information extracted from the Majordomo program, which provides an overview of the acts undertaken in the scene. These discussion lists can be correlated with student enrolment details providing an overview of the characteristics of the students (agents) who choose to be involved with email discussion lists (scene). This produces an analysis similar to Althaus’ (1997) delineation of groups of agents as participants, partial participants (lurkers or browsers) and non-participants. That is, the analysis can characterise different kinds of participation in the course discussion list with particular emphasis on patterns of subscription.

In a recent review of relevant research (Ruth, 2002b), the primary focus seemed to be on the descriptive aspects of the use of online learning environments. This focus is useful for identifying patterns of use, analyses of activities and accounts of participants and participation in online learning environments (Tafti and Shirani, 1997, Riedl, 1989, Piburn and Middleton, 1998, Jonassen and Kwon, 2001, Fahy et al., 2001).
Constituting online learning environment

Consequently, a focus on the descriptive aspects constitutes the starting point for the current research, because this allows an initial comparison between this investigation and previous research. The descriptive detail provided is extensive and assesses a wide range of aspects of discussion list usage. This description is essential for understanding the processes that will be described more comprehensively in following chapters; specifically, how students engage in learning within a ‘virtually’ constituted environment. This description of what constitutes the online learning environment provides a foundation upon which the selection of the four courses is premised. Aspects of discussion list usage investigated include: (i) characteristics of students cohorts; (ii) characteristics of the students subscribing; (iii) characteristics of the students participating; and (iv) patterns of participation. Thus, this analysis provides a context for understanding the ways in which students (agents) interact (act) in email discussion lists (scene).

The chapter is structured as follows. Firstly, it briefly describes the ten courses in order to specify similarities and differences between the courses. The patterns of subscription, the initial act that places the agent in the scene, are then discussed. Finally, the patterns of participation, that is when messages are sent and who sends them, are described and discussed. This provides a basis for selection of the four courses, which will be analysed further in Chapter Five.

4.2 Courses (Scenes)

The ten courses initially selected for analysis comprised introductory (i.e. first year) and advanced (i.e. second and third year) courses whose scope ranged from multimedia to mathematics. A number of the courses have a practical focus which included learning specific skills centred on computer programming or the general use of computers and networks.

Table 4.1 describes the contents of the 10 courses. These descriptions are derived directly from the course profile, which sets out all requirements for the student. The full title is initially provided followed by an abbreviation in parenthesis, which is used throughout this and subsequent chapters. The courses comprised: Multimedia Design (MultDes); Business Computing (BusCom); Systems Analysis (SysAnal); Mathematical Computing (MathComp); Computer Programming (ComProgA, ComProgB, ComProgC); Software Quality Assurance (SQA); Networking (Net) and Computing
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Applications (ComApp). Courses BusCom and ComApp are designed to introduce basic computer concepts, while the remainder of the courses assume a basic level of computer skill. Many students take one of these courses to provide them with grounding and improved skills in effective computer use. BusCom and ComApp, along with Courses MathComp, ComProgA and ComProgB are introductory level aimed at first year students who form the majority of enrolments. The remaining courses are advanced level and assume much of the knowledge gained in introductory courses. BusCom accepts students from both Information Technology and Business degrees. Thus, the courses constitute potentially different sub-populations of students who are interested and engaged in learning about computers and related subfields.

<table>
<thead>
<tr>
<th>Title</th>
<th>Acronym</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Multimedia Course</td>
<td>MultDes</td>
<td>Examines the conceptual design skills needed to structure ideas suitable for a range of audiences. Examines principles of multimedia instructional design.</td>
</tr>
<tr>
<td>Introductory Information Systems Course</td>
<td>BusCom</td>
<td>Focuses on the relationship between computer technology and business organisations.</td>
</tr>
<tr>
<td>Advanced Information Systems Course</td>
<td>SysAnal</td>
<td>Focuses on approaches to structured systems analysis.</td>
</tr>
<tr>
<td>Introductory Mathematical Computing Course</td>
<td>MathComp</td>
<td>Introduces some of the mathematics underlying the operation of computer systems.</td>
</tr>
<tr>
<td>Introductory Programming Course</td>
<td>ComProgA</td>
<td>Introduces structured programming principles, the software development life cycle and the design of structured programs.</td>
</tr>
<tr>
<td>Intermediate Programming Course</td>
<td>ComProgB</td>
<td>Develops more advanced computer programs using object-orientated methods. (Follows directly from ComProgA)</td>
</tr>
<tr>
<td>Advanced Programming Course</td>
<td>ComProgC</td>
<td>For people with a knowledge of structured programming who want to learn how to write object-oriented programs. (Follows directly from ComProgB)</td>
</tr>
<tr>
<td>Software Quality Assurance</td>
<td>SQA</td>
<td>Aims to introduce software quality assurance.</td>
</tr>
<tr>
<td>Advanced Networking Course</td>
<td>Net</td>
<td>Focuses on the concepts and principles intrinsic to the understanding of the technologies that are used in modern, electronic communications and computer networking.</td>
</tr>
<tr>
<td>Introductory Computing Application Course</td>
<td>ComApp</td>
<td>Introduces several common productivity software applications, including presentation graphics, and word processing, spreadsheet, and database.</td>
</tr>
</tbody>
</table>

Table 4.1 Courses selected for investigation

Table 4.2 describes these courses in terms of students enrolled, the proportion of female students and the proportion of externally enrolled students. These factors are important because, as foreshadowed, it was necessary to select courses with large enrolments, those that included both male and female students and included students...
who studied in geographic or temporal isolation from the host university. The number of students enrolled in the courses ranged from 123 to 973. These are all medium to high numbers of students in a single course. Such large cohorts should represent the range of student abilities, backgrounds and interests in engaging in higher education. The largest enrolments occur in the business-based course (BusCom) and the introductory programming and computing courses (ComProgA and ComApp). These courses are foundation courses in which students from diverse backgrounds and disciplines will engage. Potentially, such courses should provide a broadly representative sample of higher education students.

<table>
<thead>
<tr>
<th>Course</th>
<th>Enrolments</th>
<th>Females (%)</th>
<th>External (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultDes</td>
<td>223</td>
<td>26.7</td>
<td>38.8</td>
</tr>
<tr>
<td>BusCom</td>
<td>973</td>
<td>51.0</td>
<td>30.2</td>
</tr>
<tr>
<td>SysAnal</td>
<td>123</td>
<td>33.6</td>
<td>27.4</td>
</tr>
<tr>
<td>MathComp</td>
<td>535</td>
<td>13.5</td>
<td>15.4</td>
</tr>
<tr>
<td>ComProgA</td>
<td>790</td>
<td>19.7</td>
<td>27.0</td>
</tr>
<tr>
<td>ComProgB</td>
<td>171</td>
<td>15.5</td>
<td>37.4</td>
</tr>
<tr>
<td>ComProgC</td>
<td>220</td>
<td>13.3</td>
<td>52.7</td>
</tr>
<tr>
<td>SQA</td>
<td>131</td>
<td>19.9</td>
<td>45.0</td>
</tr>
<tr>
<td>Net</td>
<td>478</td>
<td>16.7</td>
<td>38.2</td>
</tr>
<tr>
<td>ComApp</td>
<td>806</td>
<td>20.2</td>
<td>37.3</td>
</tr>
</tbody>
</table>

Table 4.2 Descriptions of students in the courses

The proportion of female students is shown in the second column of data. With the exception of BusCom (business – 51 percent female students) the proportion of female students is low and ranges from 13 percent to 34 percent. Thus, excluding the business course, the proportion of female students is around one third or less. This is perhaps reflective of these technology-based courses alienating and, indeed, excluding women, because they are seen to enunciate masculinity (Bernstein, 1997). Computer programming has long been associated with ‘masculine’ values (Bernstein, 1999), because it encourages focused and obsessive behaviour, a trait not encouraged in women (Bernstein, 1997). Business, on the other hand, is becoming more welcoming to women (Carrington and Pratt, 2003). The business course attracts more female students due to its focus on business computing including application-based production of documents predominantly within the Microsoft Office suite of applications. However, as introductory business information systems falls within a ‘business’ degree rather than
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an information technology degree, more women tend to enrol and gain fluency in technology.

The proportion of externally enrolled students ranges from 15% to 53% (third column of data). The lower percentage relates to an introductory level course while the higher percentage relates to an advanced level course. The implication here is that these students may be more comfortable with the content, and being more advanced and independent, may be more likely to study off campus, with many working in the IT industry (45% of respondents in the survey reported working in the IT industry).

In summary, the courses are medium to large in terms of class size; the students are generally male, and more likely to be enrolled externally in the advanced courses. Importantly, the numbers of students, their location in allied courses, gender profile and inclusion of external students suggest that these courses will reflect the kinds of cohorts of students who inhabit higher education, although as students in Information Technology courses, they might be expected to be highly familiar with the technology and thus exhibit the best possible use patterns; that is, these students are comfortable with and savvy about the use of computers. In describing the courses (scenes), there is a partial description of the students (agents), because for each individual the other members of the discussion list constitute part of the scene.

Two courses were eliminated from some descriptions, because one had no weekly record of the subscribed students (Net information was collected by the course coordinator) and the other (ComApp) because the course required subscription for submission of an assignment sent to the discussion list, which skews the voluntary nature of subscription. This means that student participation is no longer voluntary, but necessary to complete the course. Students must subscribe in order to complete the assessment regardless of any perceived benefits that the student may gain from their subscription. This research particularly focuses on voluntary, as opposed to mandatory engagement of students in discussion lists.

Table 4.3 shows the proportion of students who declared their email address (i.e. first column of data) on enrolment, the proportion of these students who subscribed to the lists (i.e. second column of data), the proportion of external students who subscribed (i.e. third column of data) and the proportion of subscribed students who were enrolled externally (i.e. fourth column of data). In each of the eight courses, greater than 60 percent of students had access to the technology as evidenced by the declaration of an
email address and thus may be assumed to use email in some form. However, the proportion of students who claimed to have used this technology within their learning-related activities through subscribing to a list (i.e. second column of data in Table 4.3) is considerably lower, with the highest proportion in a course just over 64 percent and the lowest at almost 28 percent. This indicates that many students (36 to 72 percent) who have access to electronic facilities are not taking up the opportunity to engage in online learning environments.

<table>
<thead>
<tr>
<th>Course</th>
<th>Addresses (%)</th>
<th>Subscribed (%)</th>
<th>External students subscribed to list (%)</th>
<th>Subscribed students who are external (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultDes</td>
<td>75.3</td>
<td>37.7</td>
<td>63.6</td>
<td>55.4</td>
</tr>
<tr>
<td>BusCom</td>
<td>64.1</td>
<td>30.8</td>
<td>25.4</td>
<td>20.4</td>
</tr>
<tr>
<td>SysAnal</td>
<td>65.6</td>
<td>27.9</td>
<td>71.9</td>
<td>53.5</td>
</tr>
<tr>
<td>MathComp</td>
<td>60.4</td>
<td>32.7</td>
<td>45.9</td>
<td>18.9</td>
</tr>
<tr>
<td>ComProgA</td>
<td>60.9</td>
<td>36.8</td>
<td>40.5</td>
<td>25.9</td>
</tr>
<tr>
<td>ComProgB</td>
<td>63.2</td>
<td>30.3</td>
<td>51.3</td>
<td>56.5</td>
</tr>
<tr>
<td>ComProgC</td>
<td>88.6</td>
<td>64.1</td>
<td>71.4</td>
<td>54.3</td>
</tr>
<tr>
<td>SQA</td>
<td>85.9</td>
<td>58.3</td>
<td>72.7</td>
<td>50.5</td>
</tr>
</tbody>
</table>

Table 4.3 Proportion of students in each course with addresses and subscribed to the class discussion list

Columns 2 (i.e. subscribed) and 3 (i.e. external students subscribed) in Table 4.3 indicate the rates at which external students participate. For instance, in SysAnal, while nearly three quarters (72 percent) of external students subscribe to the discussion list, they account for slightly more than half (54 percent) of the students subscribed. As they constitute only 27 percent of the total students in the course, this suggests external students are more likely to be involved in online learning environments, such as through subscribing to lists, where they are provided. Thus a majority of external students in this course subscribe and they make up more than half the students subscribed to the list. This is in contrast to MathComp in which nearly half of all external students subscribed, yet they accounted for less than one fifth (19 percent) of the subscribed students. As online learning environments are being incorporated into teaching in an attempt to foster dialogue and interaction between students (Boettcher and Cartwright, 1997), it is understandable that external students, traditionally denied the contact and support of their peers, would take up this innovation at a greater rate than their on-campus colleagues.
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In five of the eight courses, external students accounted for more than 50 percent of the subscribed students (Table 4.3) but less than 50 percent of enrolled students (Table 4.2). Only one course (BusCom) had a lower proportion of off campus students subscribed than in the course itself. The generally high proportion of off campus students subscribed to lists (when compared to the proportion of students attending off campus) indicates that many off campus students are availing themselves to the resources being provided by email discussion lists. As these students have limited contact with the university under normal circumstances, their willingness to participate indicates recognition of the need to find ways of participating in the courses and interacting with staff and other students.

Table 4.4 shows the relationship between list membership and achieving a passing grade or better in the course. As an indication of the value of involvement in the lists, the proportion of students receiving a passing grade was higher among subscribed students (Table 4.4). The first column of data indicates that the proportion of all students (including those not subscribed) achieving at least pass scores ranges from 55 percent to 81 percent. This is contrasted with the proportion of passing grade students who subscribed to the list as between 32 percent and 84 percent, as presented in the second column of data. The last column in Table 4.4 shows the proportion of the subscribing students who passed being between 75 percent and 89 percent. This is effectively the same sub-group of students viewed from whether they passed and whether they subscribed. This indicates that students who subscribe to discussion lists, particularly in advanced courses, are more likely to pass.

<table>
<thead>
<tr>
<th>Course</th>
<th>Students achieving a passing grade (%)</th>
<th>Passing students subscribed to list (%)</th>
<th>Subscribed students who passed (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultDes</td>
<td>72.0</td>
<td>45.7</td>
<td>77.9</td>
</tr>
<tr>
<td>BusCom</td>
<td>74.3</td>
<td>43.4</td>
<td>89.4</td>
</tr>
<tr>
<td>SysAnal</td>
<td>77.4</td>
<td>32.2</td>
<td>76.3</td>
</tr>
<tr>
<td>MathComp</td>
<td>67.3</td>
<td>43.0</td>
<td>80.4</td>
</tr>
<tr>
<td>ComProgA</td>
<td>62.4</td>
<td>51.5</td>
<td>76.5</td>
</tr>
<tr>
<td>ComProgB</td>
<td>55.3</td>
<td>48.8</td>
<td>70.0</td>
</tr>
<tr>
<td>ComProgC</td>
<td>74.1</td>
<td>84.1</td>
<td>82.0</td>
</tr>
<tr>
<td>SQA</td>
<td>80.8</td>
<td>73.6</td>
<td>86.7</td>
</tr>
<tr>
<td>All</td>
<td>69.3</td>
<td>48.7</td>
<td>75.5</td>
</tr>
</tbody>
</table>

Table 4.4 Proportion of students achieving a passing grade involved and subscribed to list in each course (excluding withdrawn students)
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There are several possible explanations for this finding – firstly, subscribing students may be more engaged in self-directed learning activities than those who do not subscribe. Secondly, the kinds of interactions provided through the email discussion lists may provide an effective pedagogic tool that assists students' learning. Whether this is due to these students' greater commitment to learning or a direct result of participation is not discernible from this data. Yet, what can be proposed is that there are high expectations in terms of subscription levels by external students, suggesting that students who subscribe are more likely to be successful in their course than those who do not. However, what is not available from this data is the relationship between the kinds of activities that the students have engaged in and their success in their courses. This will be discussed in subsequent sections and chapters.

### 4.3 Subscription (Acts)

Subscription is the process (act) that places the student (agent) in the environment (scene). The act of subscribing is voluntary and undertaken by the student. It places an individual on the mailing list held by the Majordomo program. This allows students to participate (act); that is, post messages to the list recipients and to receive messages posted by other members. This has the effect of engaging the student in a range of possible interactions with other students through participation in the electronically mediated environment in which ideas can be shared. It is the process of engaging with other subscribers’ ideas, the articulation of one's own ideas and responding to interactions about those ideas that is held to be generative of learning outcomes (Rogoff, 1990, Wertsch, 1998, Vygotsky, 1978, Grossen, 2000).

The initial analysis of the subscription (act) rates of students in the email discussion lists (scenes) was undertaken using a weekly count of email addresses subscribed to each list and the number of messages sent to the list each week by subscribers. By calculating the number of email addresses as a proportion of the number of students enrolled in the course, an indicative level of the participation patterns is approximated. This indicative level is easy and simple to obtain during the period in which the course is being offered as it only requires the data collector to be subscribed to the list and to request the information from the Majordomo program. As such, subscription rate has specific value in the day-to-day running of email discussion
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lists as it provides a means of understanding student behaviour and the level of participation in a particular discussion list.

Table 4.5 presents data indicating the levels of subscriptions by percentage of students for each of the ten courses on a weekly basis throughout the semester. Each column represents a week of the study term including mid-term breaks (B1 and B2), pre-exam study week (SW) and an exam week (EW). The final column is the average of all weeks. The cells represent the proportion and the number (in parentheses) of subscribed students in the course for each week.

As presented in the table, the number of email addresses subscribed to each list as a proportion of enrolled students ranged from 41 percent to 80 percent overall and were clustered around two levels, between approximately 40-50 percent (MultDes, BusCom, SysAnal, MathComp, ComProgA, ComProgB and Net) and 70-80 percent (ComProgC, SQA and ComApp). This level is identified when the proportion stabilised after initial subscription process, which occurred up to the fourth week. It is not clear why there are two distinct levels of involvement by students. The courses are not divided by level (i.e. introductory versus advanced), nor by number of students enrolled, proportion of external students or females, or any other distinguishing feature which could explain this occurrence. The most notable feature is that the two highest subscription courses (ComProgC and SQA) also had the highest proportions of externally enrolled students. This provides a weak, non-significant correlation between subscription and external enrolment. The third course with high proportion of enrolled students (ComApp) required subscription for submission of an assignment (worth 5% of marks in total) in Week 2 providing some incentive for students to subscribe. This is also evident in the drop in student subscriptions in the third week of semester in that course.
<table>
<thead>
<tr>
<th>Course</th>
<th>Weeks</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>B1</th>
<th>B2</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>SW</th>
<th>EW</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultDes</td>
<td>34</td>
<td>38</td>
<td>43</td>
<td>45</td>
<td>46</td>
<td>47</td>
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<td>48</td>
<td>48</td>
<td>46</td>
<td>45</td>
<td>45</td>
<td>(107)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(67)</td>
<td>(83)</td>
<td>(106)</td>
<td>(112)</td>
<td>(113)</td>
<td>(114)</td>
<td>(115)</td>
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<td>(111)</td>
<td>(108)</td>
<td>(107)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BusCom</td>
<td>15</td>
<td>31</td>
<td>38</td>
<td>40</td>
<td>38</td>
<td>40</td>
<td>41</td>
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<td>42</td>
<td>42</td>
<td>42</td>
<td>(380)</td>
<td></td>
</tr>
<tr>
<td>SysAnal</td>
<td>18</td>
<td>26</td>
<td>32</td>
<td>36</td>
<td>37</td>
<td>38</td>
<td>37</td>
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<td>40</td>
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<td>38</td>
<td>37</td>
<td>(48)</td>
<td></td>
</tr>
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<td>(22)</td>
<td>(34)</td>
<td>(45)</td>
<td>(50)</td>
<td>(53)</td>
<td>(53)</td>
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<td>(49)</td>
<td>(48)</td>
<td>(48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MathComp</td>
<td>28</td>
<td>38</td>
<td>39</td>
<td>41</td>
<td>40</td>
<td>41</td>
<td>41</td>
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<td>40</td>
<td>39</td>
<td>40</td>
<td>(338)</td>
<td></td>
</tr>
<tr>
<td>ComProgA</td>
<td>28</td>
<td>40</td>
<td>41</td>
<td>45</td>
<td>42</td>
<td>43</td>
<td>43</td>
<td>43</td>
<td>44</td>
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<td>44</td>
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<td>43</td>
<td>41</td>
<td>39</td>
<td>(325)</td>
<td></td>
</tr>
<tr>
<td>ComProgB</td>
<td>19</td>
<td>29</td>
<td>30</td>
<td>34</td>
<td>38</td>
<td>38</td>
<td>41</td>
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<td>(32)</td>
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<td>(69)</td>
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<td>(73)</td>
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<td>(75)</td>
<td>(75)</td>
<td>(76)</td>
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<td>(80)</td>
<td>(80)</td>
<td>(76)</td>
<td>(68)</td>
<td></td>
</tr>
<tr>
<td>ComProgC</td>
<td>57</td>
<td>69</td>
<td>71</td>
<td>73</td>
<td>76</td>
<td>76</td>
<td>76</td>
<td>76</td>
<td>77</td>
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<td>77</td>
<td>70</td>
<td>74</td>
<td>(168)</td>
<td></td>
</tr>
<tr>
<td>SQA</td>
<td>54</td>
<td>63</td>
<td>64</td>
<td>71</td>
<td>72</td>
<td>73</td>
<td>73</td>
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<td>79</td>
<td>77</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(74)</td>
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<td>(92)</td>
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<td>(100)</td>
<td>(101)</td>
<td>(101)</td>
<td>(101)</td>
<td>(102)</td>
<td>(102)</td>
<td>(105)</td>
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<td>Net</td>
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<td>46</td>
<td>49</td>
<td>48</td>
<td>51</td>
<td>52</td>
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<td>52</td>
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<td>53</td>
<td>53</td>
<td>49</td>
<td>(236)</td>
<td></td>
</tr>
<tr>
<td>ComApp</td>
<td>44</td>
<td>72</td>
<td>68</td>
<td>75</td>
<td>72</td>
<td>73</td>
<td>71</td>
<td>71</td>
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<td>72</td>
<td>72</td>
<td>71</td>
<td>71</td>
<td>70</td>
<td>67</td>
<td>65</td>
<td>(569)</td>
<td></td>
</tr>
</tbody>
</table>
However, involvement by externally enrolled students may not explain the workings of email discussion lists entirely, as the course with the highest subscription rate produced one of the lowest volumes of email. What this data suggests is that even though the student cohorts in these courses are likely to be broadly representative of the kinds of students who will engage in these courses, there are considerable differences in the subscription rates across courses. This indicates that factors other than student-based factors (e.g. preferences, accessibility, previous experience) influence the level of subscription. In one course, there was a particular incentive (ComApp assessment item), which may have motivated students to engage. The evidence suggests that there must be course characteristics or features that influence the levels of subscription. Elsewhere (Powell, Conway and Ross, 1990), it has been noted that there are at least two other categories of factors (lifestyle and institutional) that influence an individual’s success and retention in distance education aside from the predisposing characteristics of students.

The first column of data in Table 4.6 presents the maximum weekly value of the proportion of students and the total number of students subscribed from Table 4.5. The second and third columns of data present the total number of messages and the ratio between the number of subscribers and the number of messages in the right-hand column. While the proportion of students subscribed fell into two distinct groups, the number of students subscribed ranged from 53 to 607. This higher number was in the course that required subscription for assessment (i.e. 5 percent of the marks for the course were for a single email sent to the discussion list). This also supports the proposition that course-related factors have had some influence on the students’ choice to become involved in the discussion list.
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<table>
<thead>
<tr>
<th>Course</th>
<th>Subscriptions</th>
<th>No. of messages</th>
<th>Relationship between total subscriptions and total messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultDes</td>
<td>115 (49%)</td>
<td>189</td>
<td>1.6</td>
</tr>
<tr>
<td>BusCom</td>
<td>425 (43%)</td>
<td>497</td>
<td>1.2</td>
</tr>
<tr>
<td>SysAnal</td>
<td>53 (42%)</td>
<td>108</td>
<td>2.0</td>
</tr>
<tr>
<td>MathComp</td>
<td>232 (42%)</td>
<td>226</td>
<td>1.0</td>
</tr>
<tr>
<td>ComProgA</td>
<td>361 (45%)</td>
<td>1562</td>
<td>4.3</td>
</tr>
<tr>
<td>ComProgB</td>
<td>80 (45%)</td>
<td>139</td>
<td>1.7</td>
</tr>
<tr>
<td>ComProgC</td>
<td>174 (78%)</td>
<td>1916</td>
<td>11.0</td>
</tr>
<tr>
<td>SQA</td>
<td>106 (80%)</td>
<td>234</td>
<td>2.2</td>
</tr>
<tr>
<td>Net</td>
<td>263 (53%)</td>
<td>405</td>
<td>1.5</td>
</tr>
<tr>
<td>ComApp</td>
<td>607 (75%)</td>
<td>1553</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Table 4.6 Subscriptions and numbers of messages

The number of messages, on the other hand, was not related to either the number or proportion of students subscribed (Table 4.5). The number of messages to the lists ranged from 108 to 1916. This indicates the total volume of messages that students must engage with during their engagement with the list. High numbers indicate that students may be overwhelmed by the volume of messages and not gain potentially helpful information due to information overload, while low numbers may be indicative of insufficient incentive to participate, in effect a form of ‘social dilemma’ (Holtrop, 2001). The number of messages in three courses with high proportions of students subscribed ranged from 234 to 1916, although the highest proportion of students produced the lower of these figures, while the course that required participation and had the highest number of subscribers did not produce the greatest number of messages. This suggests that the number of subscribers and the mandating of participation do not necessarily result in active list participation. There were distinct differences across the eight courses in the relationship between the number of students and the number of email messages. At its lowest, there were fewer messages than students, indicating that not all students had engaged in the activity and scene. At its highest level, there was the equivalent of 11 messages per student in one course. Again, this suggests that factors beyond individuals are shaping the kind and frequency of interactions via online learning. These differences are investigated for the selected courses in subsequent chapters.
4.4 Patterns of Participation

An initial analysis of the total volume of email as received and then sent by the Majordomo program gives an indication of the volume of mail that students confront upon subscribing to a class list. This, however, is not a clear indication of the volume sent to the list members due to errors and repeats by students. The differences lie in the filtering ability of the Majordomo program which filters out (i.e. receives but does not forward to list subscribers) messages from individuals not properly subscribed and other messages for being too long.

Table 4.7 shows the number of messages sent to each list for each course. The volume of email sent to each list was either very high (average greater than 97 per week) or very low (average less than 31 per week). This provides an indication of the amount of work that is required to participate in the discussion list. This relates to two distinct categories of total messages – greater than 1000 or less than 500. However, the differences in number of messages did not relate directly to the number of students involved. Class size, therefore, appears not to be a determining factor of the activity in a discussion list. However, the total number of messages provides an indication of the ‘work’ required of the teacher and tutors in providing support for the list. Each of the high volume discussion lists produced in excess of 1000 email messages over the 17 weeks of the term (twelve weeks of teaching plus two weeks mid-term break, an orientation week (0), a study week (SW) and an exam week (EW)). In one of these courses, an assessment item involved sending an introductory message to the list, which accounted for approximately one third of the postings, many of which occurred in the week of and the week prior to the assessment item being due.

The number of emails sent to each list generally increased in the week prior to and the week of an assignment due date (indicated in bold in Table 4.7). Where there was an exam, volume of email also generally peaked in exam week. This points to the use of the lists for the purpose of gaining understanding of the course content and, perhaps, the need for confidence building. Students often require additional support of the formative feedback type (Macdonald, 2001) and clarification when preparing for assignment submission or for an exam.
| Course/Week | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | B1 | B2 | 9  | 10 | 11 | 12 | SW | EW | PE | Total | Average |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|--------|
| MultDes     | 23 | 19 | 10 | 22 | 11 | 18 | 11 | 0  | 7  | 4  | 20 | 15 | 6  | 12 | 3  | 0  | 8  | 0    | 189    | 10.56  |
| BusCom      | 8  | 26 | 76 | 50 | 45 | 38 | 43 | 12 | 11 | 10 | 17 | 12 | 34 | 27 | 49 | 17 | 28  | 15    | 518    | 30.56  |
| SysAnal     | 5  | 9  | 10 | 16 | 15 | 6  | 8  | 9  | 2  | 4  | 2  | 2  | 4  | 3  | 8  | 1  | 4  | 6    | 114    | 6.56   |
| MathComp    | 5  | 38 | 23 | 14 | 31 | 26 | 24 | 6  | 6  | 8  | 10 | 12 | 5  | 6  | 9  | 2  | 1   | 0     | 226    | 13.81  |
| ComProgA    | 11 | 87 | 84 | 148| 132| 131| 50 | 36 | 65 | 99 | 61 | 110| 71 | 109| 233| 81 | 51  | 0    | 1559   | 97.13  |
| ComProgB    | 5  | 4  | 12 | 14 | 7  | 3  | 17 | 19 | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 6  | 28  | 11    | 0      | 139    | 8.50   |
| ComProgC    | 30 | 55 | 155| 168| 104| 230| 127| 75 | 157| 207| 69 | 39 | 26 | 63 | 78 | 99 | 2   | 1921  | 118.69 |
| SQA         | 1  | 26 | 19 | 15 | 26 | 7  | 36 | 19 | 22 | 2  | 5  | 7  | 11 | 2  | 7  | 10  | 18  | 1     | 234    | 14.56  |

Table 4.7: Number of emails to each course each week

 Constituting online learning environments

(bold indicates assignment due or an exam)
The pattern of activity evidenced by the weekly number of messages to the list is dependent on the prescribed activities in the course. For instance, the high number of messages in ComProgC in Week Six represents the submission of an assignment in that week. Thus, assessment submission may prompt students to post messages regarding requirements for assignments. This, however, is conjecture because to date, limited research has been undertaken to investigate the relationship between assessment help and non-mandated environments.

### 4.4.1 Day of the week

Table 4.8 shows the number of messages sent to each discussion list and total number of messages for each course (excluding NET and ComApp), for each day of the week. Each column represents each day while the rows represent the weeks. Each column represents the total number of messages, added for all weeks, sent to each list for each day of the week. This information is useful because it provides an overview of the ways in which the discussion lists are used. While the variation between courses is great, the majority of the courses show peak activity days of Monday, Tuesday and Wednesday. The exception to this is MathComp, which has fairly consistent activity with a minor peak on Thursday, and SQA with a peak on Tuesday. This suggests that while online learning environments are posited as ‘anywhere/anytime’ list activities are cyclical and occur at specific times regardless of individuals’ location. The total number of emails sent to these 8 courses was 4900 (last row). The total number of messages for each day gives a clearer indication of the pattern over time. The highest frequency of emails being sent was generally in the middle of the week. The overall highest was on Tuesdays with slightly fewer Mondays and Wednesdays. This may indicate that students might wait until early in the working week to be sure of a reply before sending a message. Other possible reasons for the pattern over the week include work and social patterns.
<table>
<thead>
<tr>
<th>Course</th>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultDes</td>
<td>17</td>
<td>36</td>
<td>29</td>
<td>23</td>
<td>36</td>
<td>35</td>
<td>13</td>
<td>189</td>
</tr>
<tr>
<td>BusCom</td>
<td>42</td>
<td>107</td>
<td>79</td>
<td>91</td>
<td>98</td>
<td>72</td>
<td>29</td>
<td>518</td>
</tr>
<tr>
<td>SysAnal</td>
<td>17</td>
<td>23</td>
<td>11</td>
<td>21</td>
<td>20</td>
<td>15</td>
<td>7</td>
<td>114</td>
</tr>
<tr>
<td>MathComp</td>
<td>21</td>
<td>28</td>
<td>39</td>
<td>37</td>
<td>45</td>
<td>30</td>
<td>26</td>
<td>226</td>
</tr>
<tr>
<td>ComProgA</td>
<td>133</td>
<td>293</td>
<td>293</td>
<td>269</td>
<td>225</td>
<td>181</td>
<td>165</td>
<td>1559</td>
</tr>
<tr>
<td>ComProgB</td>
<td>15</td>
<td>31</td>
<td>29</td>
<td>26</td>
<td>15</td>
<td>17</td>
<td>6</td>
<td>139</td>
</tr>
<tr>
<td>ComProgC</td>
<td>252</td>
<td>259</td>
<td>327</td>
<td>303</td>
<td>275</td>
<td>258</td>
<td>247</td>
<td>1921</td>
</tr>
<tr>
<td>SQA</td>
<td>18</td>
<td>51</td>
<td>58</td>
<td>33</td>
<td>35</td>
<td>33</td>
<td>6</td>
<td>234</td>
</tr>
<tr>
<td>Total</td>
<td>828</td>
<td>865</td>
<td>803</td>
<td>749</td>
<td>641</td>
<td>499</td>
<td>515</td>
<td>4900</td>
</tr>
</tbody>
</table>

Table 4.8  Total number of messages sent each day of the week

This data indicates that the scene that comprises students’ engagement in the learning is not constrained to particular days. Instead, there are levels of participation across every day of the week. Students’ engagement may have peaked in the middle of the week, however there were also high levels of activity occurring at the beginning and end of the week and over the weekend. This relates to the notion that learning is mediated at a time and place of the students’ choice, as highlighted in Chapter 1.

Table 4.9 is used to separate the data on the overall frequency of messages into two categories: (a) student messages and (b) teacher messages. Similar to Table 4.8, each column represents each day while the rows represent the weeks. Each column represents the total number of messages, added for all weeks, sent to each list for each day of the week. This has been undertaken to provide an insight into the workings of the list particularly with respect to the questioning and answering functions, which are predominantly carried out by students and teachers respectively. These frequencies reveal less dramatic differences between days, with the weekend showing the lowest numbers of emails sent to the list. Increases and decreases in number of emails sent to the list by staff appear to lag behind student postings by one day with the exception of Monday, which may account for a ‘catch-up’ of postings from the weekend. This pattern of use furnishes information which assists in the management of lists, as it provides a basis for understanding how students approach their learning and the requirements needed for meeting the needs of students. For instance, when and how frequently students post messages provides the justification for the employment of extra teachers for maintaining the list where appropriate. Without such information, list maintenance may be left to chance, with students feeling that the list does not fulfil the purpose for which it is provided.
Constituting online learning environment

### (a) Teachers

<table>
<thead>
<tr>
<th>Course</th>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultDes</td>
<td>3</td>
<td>7</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>BusCom</td>
<td>1</td>
<td>31</td>
<td>17</td>
<td>22</td>
<td>9</td>
<td>12</td>
<td>3</td>
<td>95</td>
</tr>
<tr>
<td>SysAnal</td>
<td>11</td>
<td>3</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td></td>
<td>37</td>
</tr>
<tr>
<td>MathComp</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>1</td>
<td>37</td>
</tr>
<tr>
<td>ComProgA</td>
<td>34</td>
<td>80</td>
<td>84</td>
<td>96</td>
<td>72</td>
<td>41</td>
<td>52</td>
<td>459</td>
</tr>
<tr>
<td>ComProgB</td>
<td>2</td>
<td>17</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>0</td>
<td>49</td>
</tr>
<tr>
<td>ComProgC</td>
<td>77</td>
<td>98</td>
<td>117</td>
<td>108</td>
<td>93</td>
<td>99</td>
<td>80</td>
<td>672</td>
</tr>
<tr>
<td>SQA</td>
<td>2</td>
<td>19</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>40</td>
</tr>
</tbody>
</table>

### (b) Students

<table>
<thead>
<tr>
<th>Course</th>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultDes</td>
<td>14</td>
<td>29</td>
<td>28</td>
<td>20</td>
<td>33</td>
<td>30</td>
<td>12</td>
<td>166</td>
</tr>
<tr>
<td>BusCom</td>
<td>41</td>
<td>76</td>
<td>62</td>
<td>69</td>
<td>89</td>
<td>60</td>
<td>26</td>
<td>423</td>
</tr>
<tr>
<td>SysAnal</td>
<td>17</td>
<td>12</td>
<td>8</td>
<td>12</td>
<td>13</td>
<td>9</td>
<td>6</td>
<td>77</td>
</tr>
<tr>
<td>MathComp</td>
<td>17</td>
<td>22</td>
<td>34</td>
<td>32</td>
<td>40</td>
<td>25</td>
<td>19</td>
<td>189</td>
</tr>
<tr>
<td>ComProgA</td>
<td>99</td>
<td>213</td>
<td>209</td>
<td>173</td>
<td>153</td>
<td>140</td>
<td>113</td>
<td>1100</td>
</tr>
<tr>
<td>ComProgB</td>
<td>13</td>
<td>14</td>
<td>20</td>
<td>18</td>
<td>8</td>
<td>11</td>
<td>6</td>
<td>90</td>
</tr>
<tr>
<td>ComProgC</td>
<td>175</td>
<td>161</td>
<td>210</td>
<td>195</td>
<td>182</td>
<td>159</td>
<td>167</td>
<td>1249</td>
</tr>
<tr>
<td>SQA</td>
<td>16</td>
<td>32</td>
<td>50</td>
<td>28</td>
<td>32</td>
<td>30</td>
<td>6</td>
<td>194</td>
</tr>
</tbody>
</table>

Table 4.9  Total number of emails sent by (a) teachers and (b) students each day of the week

#### 4.4.2 Time of day

Table 4.10 shows the contributions by teachers and students at each hour of the day and the total number of messages, as recorded by the Majordomo program, sent to the lists for all courses. This shows great variety in the volume and frequency of email contributions to the discussion list at various times of the day. The frequency of use of email lists is varied and contributions by agents (students and teachers), that is the ways in which they contribute and when, assist in understanding the value these lists play in student learning. Analysis of the totals for each hour reveals a lull in activity between the hours of 2 am and 8 am. Peaks occur between 10 and 11 am, 2 to 3 pm and 7 to 9 pm. Further analysis reveals that the majority of the early morning (2 am to 8 am) emails are from students while staff appear to send emails at distinct times, that is around 10 am after arriving at work, around 2 to 3 pm after lunch, around 8 pm after the evening meal and between 11 and 12 midnight before retiring. The most common time for students to send to the list appears to be around 8 to 9 pm. This information gives insight into the ways in which students use email discussion lists. The pattern over 24
hours shows that peaks occur at specific times of the day, while the lowest number of messages per hour occurs in the early morning.

<table>
<thead>
<tr>
<th>Hour</th>
<th>Teachers</th>
<th>Student</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 am</td>
<td>50</td>
<td>109</td>
<td>159</td>
</tr>
<tr>
<td>1 am</td>
<td>39</td>
<td>80</td>
<td>119</td>
</tr>
<tr>
<td>2 am</td>
<td>18</td>
<td>28</td>
<td>46</td>
</tr>
<tr>
<td>3 am</td>
<td>4</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>4 am</td>
<td>0</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>5 am</td>
<td>1</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>6 am</td>
<td>1</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>7 am</td>
<td>10</td>
<td>53</td>
<td>63</td>
</tr>
<tr>
<td>8 am</td>
<td>34</td>
<td>126</td>
<td>160</td>
</tr>
<tr>
<td>9 am</td>
<td>41</td>
<td>175</td>
<td>216</td>
</tr>
<tr>
<td>10 am</td>
<td>135</td>
<td>211</td>
<td>346</td>
</tr>
<tr>
<td>11 am</td>
<td>113</td>
<td>200</td>
<td>313</td>
</tr>
<tr>
<td>12 pm</td>
<td>98</td>
<td>202</td>
<td>300</td>
</tr>
<tr>
<td>1 pm</td>
<td>89</td>
<td>208</td>
<td>297</td>
</tr>
<tr>
<td>2 pm</td>
<td>149</td>
<td>217</td>
<td>366</td>
</tr>
<tr>
<td>3 pm</td>
<td>89</td>
<td>234</td>
<td>323</td>
</tr>
<tr>
<td>4 pm</td>
<td>65</td>
<td>206</td>
<td>271</td>
</tr>
<tr>
<td>5 pm</td>
<td>49</td>
<td>214</td>
<td>263</td>
</tr>
<tr>
<td>6 pm</td>
<td>49</td>
<td>170</td>
<td>219</td>
</tr>
<tr>
<td>7 pm</td>
<td>123</td>
<td>203</td>
<td>326</td>
</tr>
<tr>
<td>8 pm</td>
<td>75</td>
<td>262</td>
<td>337</td>
</tr>
<tr>
<td>9 pm</td>
<td>39</td>
<td>193</td>
<td>232</td>
</tr>
<tr>
<td>10 pm</td>
<td>46</td>
<td>187</td>
<td>233</td>
</tr>
<tr>
<td>11 pm</td>
<td>95</td>
<td>145</td>
<td>240</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1412</strong></td>
<td><strong>3488</strong></td>
<td><strong>4900</strong></td>
</tr>
</tbody>
</table>

Table 4.10  Total number of emails sent each hour of the day (subset of 8 courses)

The frequency and timing of messages to lists are important aspects for the management of lists and point to different expectations of students in learning environments (scene). The table also says much about the nature of student activity distributed across the day and night and across days of the week. The ability to post messages at any time of the day appears to be utilised by students, although there is also evidence that students are aware of the constraints of teachers who may not be able to respond immediately. Face-to-face classes, in contrast, may not allow the instant asking of questions, as evidenced by the time of sending to a discussion list, and at the time of the students’ choosing, even if the response is delayed.
4.5 Constituting the online environment

Study One provides an overview of the use of email discussion lists by students and teaching teams across 10 courses. These comprise the scene, the agent and the act. The salience here of the scene is that it provides the boundaries of activities and the ‘locale’ of learning. The agents here are the students who elect to engage in electronic interactions in quite different ways across 10 courses. Moreover, their participation is not restricted to particular times nor to the day of the week, thereby opening up the scene that comprises the online learning environment. This first study, while mainly concerned with identifying patterns of participation across 10 courses has tentatively identified considerable variation among scenes and between various categories of agents. Specifically it has identified the following.

- The number of externally enrolled students (agents) is indicative of the proportion of students subscribed to the discussion list (scene) (Section 4.2 and Section 4.3);

- The high levels of subscription by external (off-campus) students, compared to internal (on campus) students is taken as indicative of the need for these students to interact with other students and staff. This suggests that the promise for electronic interaction and the expectations of remote students is high (Section 4.3);

- Students (agents) receiving high grades were more likely to have been subscribed (act), either through motivation to succeed or as an effect of involvement in the environment (Section 4.2);

- Students (agents) who withdrew were less likely to be subscribed (act), possibly through lack of motivation resulting in disconnection from peers (Section 4.2 and Section 4.3);

- The proportion of female students (agents) subscribed was varied and depended to a certain degree on the perception of ‘male-dominatedness’ of the field of study (scene) (Section 4.2);

- Volume of email (number of acts) sent to each discussion list (scene) fell into two distinct ranges – average greater than 90 per week or average less than 40 per week. This suggests that students are responding to ‘unspoken’ aspects of list management. This is discussed further in following chapters, with particular reference to the ‘framing’ of the discussion list (Section 4.3 and Section 4.4);
Constituting online learning environment

- Email messages (acts) are more frequent just prior to assignments. It follows that the purpose for which students use email discussion lists is focused on the requirements of the course and very specific to those requirements (Section 4.4); and

- Peak activity (act) is early in the week (scene) and at certain times of the day. Consequently, not all students are taking full advantage of the ‘anywhere/anytime’ potential of online learning environments, although many appear to be able to manage a combination of both work and study (Section 4.4).

Many of these findings assist an initial understanding of how students in these 10 courses use email discussion lists. In particular, a large proportion of off-campus students subscribed to email lists and a high proportion of those subscribed received high grades (more than those not subscribed). Also, students who are subscribed are less likely to withdraw from their course (scene). Indirectly, these issues may be related to success in studying, but provide clear evidence for the continuation of the use of email discussion lists within educational settings. While this is an important aspect of the use of email discussion lists, the ways in which students actually use them, specifically the purpose of messages they send, responses they receive and the benefits they gain from participation have yet to be addressed. These issues are addressed in the following chapters.

4.5.1 Course selection for subsequent and more comprehensive analysis

Following from this analysis, it was decided to select four of the ten courses for further investigation and a more detailed analysis. The basis for selection of these four courses was differences in use patterns among participants. Table 4.11 uses the two-dimensional categorisation described in section 3.4.1 to identify factors to assist the selection of four courses for further investigation. The Table is divided into columns that identify courses with both high and low number of messages and rows indicating high and low proportions of subscribers. These measures were selected to provide a range of examples of how the lists could be used.
Constituting online learning environment

<table>
<thead>
<tr>
<th>High number of messages</th>
<th>Low number of messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>High proportion of</td>
<td>ComProgC</td>
</tr>
<tr>
<td>subscribers</td>
<td>ComApp</td>
</tr>
<tr>
<td>Low proportion of</td>
<td>SQA</td>
</tr>
<tr>
<td>subscribers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MathComp</td>
</tr>
<tr>
<td></td>
<td>MultDes, BusCom, SysAnal, ComProgB, Net</td>
</tr>
</tbody>
</table>

Table 4.11 Categorisation of courses

Those courses and lists to be investigated further were chosen on the following bases:

- Courses with both high and low rates of subscription were seen to offer useful bases for further investigation because they offered potentially different populations thus giving more information about the use of email discussion lists in education than comparing similar lists.

- Courses with both high and low frequency of messages were seen as useful bases for further investigation because the ways in which the lists are being used presents differences that may or may not be accounted for by differences in populations.

The discussion list for ComProgC had a high proportion of enrolled students subscribed (79 percent) and a high volume of email (more than 8 per student subscribed). This indicated a very active list and was confirmed by preliminary investigation. ComApp, the other high subscription, high participation list was eliminated because it was used for assessment purposes which skewed the voluntary subscription rate.

The list for the ComProgA was chosen as it had a relatively low subscription rate (45 percent) yet a high total volume of email – the second highest, and a high level of participation greater than 2.5 messages per student subscribed. It was the only list in the low subscription, high participation category.

SQA was chosen as it had a high subscription rate (80 percent) while its total volume was relatively low (234 messages) and the rate of participation was low – less than 2 messages per student subscribed. It was the only course that had a low subscription rate and a low participation rate.

The list for MathComp had a very low rate of subscription (42 percent) and a low volume of email (fewer than 1 message per subscriber). This indicated a relatively inactive list. MathComp had 232 students subscribed while Net had 263 indicating
similarly sized populations. Net did not have a complete list as the course coordinator collected the information so it was not included. BusCom was not selected due to the high proportion of female students, which sets this list apart, and the focus on business as opposed to information technology. Initial analysis of the messages showed a high rate of repeated messages indicating that the functioning of this list is minimal in terms of a learning environment. During initial analysis, it was discovered that SysAnal was used for assessment purposes. SysAnal’s assessment requirement became obvious as on campus students were required to present a short research piece to the class, while off-campus students had their assessment modified to incorporate submitting this research piece to the list for comments. This list was thus eliminated. SysAnal and ComProgB had the lowest total number of subscribers (both under 100 in total) and were thus eliminated.

The following chapter addresses the interactions occurring between individuals on these four selected lists (MathComp, ComProgA, ComProgC and SQA) and documents their form and function. It uses Burke’s (1969) Pentad of act, scene, agent, agency and purpose to describe and analyse the interactive learning processes that occur within these email discussion lists. This analysis of interactions within Burke’s (1969) Pentad effectively goes beyond the simple description that has been presented here.
5. Elements of an electronic mediated learning environment

5.1 Burke’s Pentad in an online learning environment

This chapter, using data from Studies Two and Three, seeks to establish how each element of Burke’s pentad, consisting of the five elements – act, scene, agent, agency and purpose, is manifested within an online learning environment and assists illuminating that environment, thereby providing bases by which the environment can be critically appraised. Each element is described and discussed separately using data from enrolment records and student subscription to the email discussion lists. Examples to elaborate and support these discussions are extracted from the activities as exhibited by messages in the list archives and responses to a survey of students participating in the selected courses. However, as Burke notes, these elements are overlapping and interwoven.

There is, of course, a circular possibility in the terms. If an agent acts in keeping with his [sic] nature as an agent (act-agent ratio), he [sic] may change the nature of the scene accordingly (scene-act ratio), and thereby establish a state of unity between himself and his [sic] world (scene-agent ratio). Or the scene may call for a certain kind of act, which makes for a corresponding kind of agent, thereby likening agent to scene. Or our act may change us and our scene, producing a mutual conformity. Such would be the Edenic paradigm, applicable if we were capable of total acts that produce total transformations. In reality, we are capable of but partial acts, acts that but partially represent us and that produce but partial transformations. (Burke, 1969, p19)

Therefore, each element is inextricably linked with others. The partiality of the acts in relation to what we (agents) do, for instance, means that the relationships between elements is of high importance. However, the virtuality of an online learning environment presents a particular challenge to using and evaluating the utility of the pentadic elements. This arises from the lack of direct interpersonal engagement, or physicality, presenting a distinct descriptive requirement. A physical scene with co-present agents, undertaking visible acts with concrete forms of agency, such as might occur in a traditional classroom setting, likely presents a more readily described interaction. Yet, when agents are physically separated and interact through mediated means, both the agency of that interaction and the scene in which the interaction takes
place may be subject to greater variation between individuals. This likely arises because the opportunities for intersubjectivity or shared understanding are rendered more remote by the lack of opportunity to interact interpersonally, as in face-to-face encounters. Newman, et al. (1989) referred to the opportunities provided by classroom activities for students to share and clarify meaning through face-to-face interaction, as well as those with their teachers. They point to the need for meaning to be clarified and shared because without such interactions, individuals’ conceptions may remain distinct and idiosyncratic. Thus, a common understanding among individuals in online learning environments may need to be established and, indeed, be a basis for the interactions in which they engage, and represent a means by which they are judged to be effective.

This chapter seeks to identify how each of the Pentadic elements can describe an environment that has a distinct form of materiality. Materiality means a physical presence, while the distinct form of materiality in this environment has a less observable and measurable form, being virtual, and lacking physical features. Presence is an illusion. For instance, Hayles (1999, p29) maintains that ‘books and humans have something to lose if they are regarded solely as informational patterns’, that is, as a virtual, rather than a physical, object. In this way, our perceptions of other agents within a virtual scene may relate more to informational representations than physical representations, yet not be wholly encompassing of the presence of the ‘other’.

Further, this chapter describes and discusses each element in turn, highlighting how scene, agent, act, agency and purpose can be used to illuminate the pedagogic properties of an online learning environment created by using computer-mediated communication via the Internet. This discussion builds upon the four courses selected, as described in Chapter Four, based on the proportion of subscribers and the number of messages. The four courses were: (i) Introductory Mathematical Computing (MathComp) having a low volume of messages from a small proportion of students; (ii) Introductory Programming (ComProgA) having a high volume of messages from a small proportion of students; (iii) Advanced Programming (ComProgC) having a high volume of messages from a large proportion of students; and (iv) Advanced Software (SQA) having a low volume of messages from a high proportion of students. In this chapter, these four selected courses are the platform for the application of Burke’s (1969) Pentadic Elements to the online environment. The data is drawn from the student survey, the archived messages from the semester and enrolment data.
The chapter is structured so that each of the pentadic elements is used to progressively and collectively illuminate the online learning environment that comprises each of these courses and in turn, to provide the opportunity to appraise the environment’s pedagogic qualities. The ordering commences with Scene, followed by Agent, Act, Agency and Purpose. Following the discussion of each element, tensions across these elements are identified and discussed. It is argued that while the pentadic elements individually can be used to illuminate the online learning environment sectionally, it is only through their integration and an acknowledgement of their interdependence that the potency of the learning environment can be understood.

5.2 Scene

The scene was defined in Chapter Two as a place where something occurs. Generally, this is defined as a physical location. In Burke’s terms, the main question concerning scene is whether it is a fit ‘container’ for an act. This means, to some extent, whether the scene can be held to allow some acts and prohibits others. For example, sending a question to a class discussion list is acceptable provided it relates in some way to the course. However, a statement about or flaming – attacking – a peer may be less acceptable. For the purposes of this analysis, the learning environment, that is, the totality of attributes affecting learning, can be used to define the scene. In an online environment where participants are not co-located, the scene is therefore defined both by the common features of which all individuals are aware, although their conceptions may be quite different from one another, and those features that affect single individuals in different ways. So, for instance, the participants will engage through a computer screen – a screenface – that has a set of common features and elements. However, they may well have different conceptions about the utility of these elements or how best they might use the elements of the screenface.

When analysing a university course as a scene, it is important to describe the features that distinguish that course from other courses, as well as those features that remain constant. This is because the commonalities define a standard set of possibilities, allowing agents to engage consistently within the online environment (scene), while differences may relate to specific courses or individuals within a course. The common features of the selected courses include each course having a website, at least one teacher, an email discussion list, class time for students on campus, course
materials and some form of assessment. The course website comprises at least six pages, including: (i) an ‘introduction’ page linked to an electronic copy of the course profile (providing information concerning content, assignments, communication options and contact details – an official university document); (ii) an ‘updates’ page containing a list of updates to the website and the course offering; (iii) a ‘study schedule’ page containing an outline of weekly activities; (iv) an ‘assessment item’ page containing the assessment items and their due dates; (v) a ‘resources’ page with links to all available online resources including information about the communications for the course (an email discussion list) and listing of offline resources; and (vi) a ‘contacts’ page which lists all the lecturers and tutors associated with the course. Each course has a common duration of twelve weeks plus two weeks mid-semester break, one week exam preparation and one week of exams, thereby constituting a total of sixteen weeks. The differences among the courses include the course content; the number of tutors (extra teachers); the framing, that is the way the course is presented to students; the number of students involved; the level within the overall program (introductory or advanced) and the pedagogic approach taken by the teacher. Students are not necessarily aware of all these parameters, particularly the approach taken by the teacher.

All four courses analysed in this study had the common features, with very little variation between formats (e.g. the web pages were almost identical in design, although actual content differed). The four courses were within the common discipline of Information Technology (including programming, mathematics, software design). MathComp and SQA aimed to develop conceptual understanding of programming principles, while ComProgA and ComProgC focused on development of practical skills in computer programming.

Table 5.1 shows a range of scenic descriptors for each course. The first row of data briefly outlines the stated aims of the course. The second row of data indicates that the size of the cohort was either very large (i.e., more than 500 students enrolled) or large (i.e. between 100 and 500 students). Courses with less than 100 students enrolled were not considered, as noted in Chapter Four. This selection criterion relates to one of the aims of this research study, which is to determine whether it is feasible to have large cohorts of learners as an effective element of an online learning environment. The assumption here is that the size of the group should be less than 50 (Turoff et al., 1999) because the expected number of messages generated by large groups would most likely
be large, due to an expectation that every student would post to the list. However, as displayed in the third row of Table 5.1, the number of messages in each course does not appear to be associated with the number of students with the largest groups (i.e. ComProgA and MathComp). These two groups generated 1541 and 224 messages with 796 and 548 enrolments respectively. By comparison, the smaller groups (ComProgC and SQA) generated 1917 and 238 messages with 212 and 130 enrolments respectively. So there are wide variations in the frequency by which students in these courses interact electronically. Thus, students work with widely varying amounts of information received in the form of email messages. The total number of messages provide an indication of the potential level of work that needs to be undertaken in order to process all the information made accessible to the students in the form of email messages. As discussed in the previous chapter, the number of students enrolled per se is perhaps not indicative of the influence of students’ acts on the volume of messages, because only a proportion of students subscribed and participated (see section 4.4 for a description of these acts).

<table>
<thead>
<tr>
<th>Course identifier</th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aims</td>
<td>Introduces some of the mathematics underlying the operation of computer systems</td>
<td>Introduces structured programming principles, the software development life cycle and the design of structured programs</td>
<td>For people with a knowledge of structured programming who want to learn how to write object-oriented program</td>
<td>Aims to introduce software quality assurance</td>
</tr>
<tr>
<td>Enrolments</td>
<td>548</td>
<td>796</td>
<td>212</td>
<td>130</td>
</tr>
<tr>
<td>No. of messages</td>
<td>224</td>
<td>1541</td>
<td>1917</td>
<td>238</td>
</tr>
<tr>
<td>Female students (%)</td>
<td>13</td>
<td>19</td>
<td>11</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 5.1 Scenic descriptors of the four courses

Like many information technology courses, all four courses had many more male than female students, with the highest proportion of female students in ComProgA (19%), as shown in Table 5.1. The level of gender difference in the student cohort may lead to differences in conversational styles and other communicative features (Thomson and Murachver, 2001, Rossetti, 1998). If this proposition is more broadly applicable, it may well be the case that a more dialogic interaction will occur with high levels of female participation. Conversely, it has been argued that males are more likely to engage in a more adversarial form of interaction (Herring, 1994). This leads to the
proposition that participants’ gender plays a role in an online environment. Women may be more likely to promote a community around the notion of assistance and a preponderance of males could lead to an un-invitational environment in which to interact. Consequently, the low proportion of female students in these four courses may have an impact upon the scene that comprises the basis for interactions in the online learning environment.

Table 5.2 presents data that indicates how the lists are referred to in the course profile and course website. It details the specific wording extracted from university documents beyond specific subscription details. The course profile and the website constitute the information that students are provided before engaging with the course content material. These resources provide some bases for students’ decision-making about whether to subscribe to the list and how the list will assist in their studies. The course information given to students when they enrol illustrates other types of scenic parameters. The term ‘framing’ is used to denote the boundaries of the scenic parameters of the discussion lists. For instance, when students subscribe to a list, they find information from the course coordinator about the nature of the list and its intended use (i.e. its framing) along with the information about the course, particularly that provided in the course profile and associated website. Its framing is important because it sets the boundaries for what is possible and allowable within the course. It provides a succinct summary of the expectations the course coordinator has of students who choose to become participants in the course.

Both introductory courses (MathComp and ComProgA) were extensively framed, with the lists being mentioned two and three times (respectively) in the course profile and in ways that attract the reader's attention. In contrast, the advanced courses had far less emphasis in the course profile. In ComProgC, the lists were mentioned only once and not at all in SQA. All course web pages contained information about the list. The overall framing of the discussion lists ranges from proposing the list as a ‘self help’ group where students can help each other and which can be interpreted to suggest that the course coordinator’s role will be minimal (MathComp), to an explicit statement that students are expected to participate (ComProgC). The information for the other two courses, ComProgA and SQA also has an implied expectation about student involvement. ComProgA states that the discussion list ‘provides current information from the lecturers and tutorial support from both lecturers and peers’ and ComProgC
states that students not yet subscribed to the list ‘should do so’ implying that participation is a obligatory part of the course setting. In this way, because they set out the activities and outline goals, course information and related framing are scene-setting devices. These features are analogous to what Searle (1995) refers to as institutional facts. They are a product of sets of institutional rules and norms. However, as discussed later, it is the degree by which individuals engage with institutional facts which constitutes a key element of the learning environment.

<table>
<thead>
<tr>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Profile</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Details on subscription to this self-help group list are listed below</td>
<td>The e-mail list provides both current information from the lecturers and tutorial support from both lecturers and peers</td>
<td>The mailing list provides a forum for discussion about object oriented programming in C++. All students are expected to subscribe to this list</td>
<td></td>
</tr>
<tr>
<td>Why not subscribe to the list and join in the discussions?</td>
<td>There are three levels of help available, firstly the mail list for [course] (e-mail)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>We strongly encourage the use of the mailing list to discuss your queries and help other students</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Web pages** | | | |
| Learn how to use the mailing list and view the archives of the course mailing list | Learn how to use the mailing list and view the archives of the course mailing list | The mailing list for this course, provides a forum for discussion about object-oriented programming in C++ | If any student has not yet joined the mailing list, they should do so |

Table 5.2 Framing of email discussion lists found in course-related material

Framing additionally occurs within the interactions within the discussion list and can give insight into the features that influence the individual. The interactions can be obtained from the electronic archive in which all messages sent to the discussion list are saved. This archive, available to all subscribers whilst they are subscribed, essentially becomes a snapshot of the scene from a specific viewpoint. It provides an indication of the scene, of the parameters of the discussion list, but also what acts are performed and permitted on the list as developed both before and during the course of the semester, thereby emphasising the interdependency between act and scene. As discussed later, these acts are often loosely defined as to be ‘evolving’, that is, acts can be defined as
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appropriate or inappropriate to the list during the course of the semester (see section 5.3).

The following illustrative example from the message archive shows a member of a teaching team framing the knowledge intended to be acquired through participation in the course. The information provided includes the main goals for the course and where these are found, as well as activities that provide the opportunity for students to learn and consolidate their knowledge:

Module 9 provided a general overview of STL. By the end of module 10 you should be able to write code that makes use of STL containers, algorithms and iterators. Try the exercises that appear on pages 161 to 163 of the study guide. [Lecturer – SQA]

Through this and other examples, students were provided with a frame of reference for interacting with the course material. There is a sequence of modules each with an outcome and associated activities. Implicit in this lecturer’s comment is that the list and its participants are also a resource for gaining understanding of the course materials.

Student perceptions of the discussion lists also have a scenic quality, that is, descriptions of the list refer to specific instances that assist in defining the scene. For instance, the following are illustrative examples of students’ responses in the survey that indicate a physicality to the online environment and to their study interactions, and places boundaries on the potential of discussion list interactions. Here, and elsewhere, the respondents to the survey are indicated in parentheses:

[It’s] like discussing things in a classroom [Resp. #54, ComProgC]

It’s just a different sort of classroom [Resp. #35, SQA]

[It’s] a substitute for hanging around after classes and discussing study matters [Resp. #60, not stated]

[It’s] A classroom style learning facility where all students are kept up to the same level [Resp. #29, SQA]

Each of these responses refers to the ‘classroom’, which is a scene with which most of these students would have had experience. Their tendency to use the ‘classroom’ metaphor (Wilson, 1995) engages with the scenic element of the pentad, adding weight to the understanding of online interactions occurring within a specific form of environment, and also an indication of conception and expectations that were
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established earlier in their learning careers. This again emphasises the interdependency between elements, in this case, the scene and the agents.

Further, a total of 38 students (29%) referred to the discussion lists in terms of place, that is:

‘a place for discussion’ [Resp. #62, ComProgC],
‘best place for finding interesting facts’ [Resp. #3, MathComp, ComProgA]
‘It’s a place I go to as an extra resource’ [sic] [Resp. #98, MathComp]

For many students, the ‘almost’ physicality of the discussion list is an important aspect:

It is the easiest way to find answers and tips for exams and things that you can never find in books... [Resp. #108, ComProgC, SQA]

I like to interact with lecturers like this, it seems the next best thing to face to face contact. [Resp. #65, ComProgC]

Thus, students utilise terms associated with a physicality to them such as ‘tool’ and ‘resource’, both terms historically connected with physical objects. This suggests that the students’ ways of working in this online learning environment have built upon the earlier expectations of what is provided in classroom environments and how they learnt to succeed in these environments. This indicates a capacity to transfer aspects of expectations about learning environments from one kind to another.

Students’ individual ways of working become evident in responses to the student survey referring to the discussion lists as:

‘a very useful tool’ [Resp. #35],
An excellent resource that fills in the gaps that are created by not having the luxury of face to face interaction with the lecturer/other students [Resp. #23]

I feel it is a place I go to if a person is stuck or needs an explanation [sic]. [Resp. #98]

Each of these responses displays a distinct form of mediation between the individual and the discussion list. The distinctions between face-to-face and online interactions are exemplified by Respondent #23 who indicates a kind of response that has been enacted to overcome the loss of a physical presence for interaction. This lack of physical contact means that individual agents operate from individual environments.
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The physical environment that constitutes the basis for the scene for many students is a home computer. Ninety five percent of students in the survey reported that they accessed the email discussion lists from a home computer. Of the six students of the total of 129 who reported they did not have access at home, two reported access solely from the university and three solely from work. The remaining student did not respond to this question. Fifteen students had access from home, from work and via the university system. Forty-five students accessed their email from home and via the university system. Thirty-six students accessed the discussion list via home and work. Twenty-six students accessed the discussion list from home only. Consequently, the majority of these students, then, were accessing their course materials from a familiar environment, notably home or at work. This establishes the local, individual environment as a familiar space within which to work as well as multiple environments (e.g. home and work). This familiarity is important because the scene incorporates both a local and a global aspect, with the local being related to a specific individual, while the global is the commonalities of the specific course[s]. All these responses indicate the influence the discussion lists have on how these students work and view the list. Students tend to refer to discussion lists as a place or way of working – with place implied – and access the discussion lists from a familiar environment.

In summary, the scene, for these students, comprises the framing of participation in the course by material, resources, teaching staff, discussion lists etc. The interactional means of the discussion list as a forum provide a physical place and the location from which to interact. All this accentuates the interdependency between scene and agents. The scene likely assists in defining the structured processes necessary for learning (acts). However, the range of processes available to students is not uniform in either provision or interpretation. These variations are discussed in section 5.4. The scene also mediates interactions between students and the teaching staff, because individuals are only ‘present’ in their messages. Hayles (1999 p29) describes this as ‘an epistemic shift toward pattern/randomness and away from presence/absence’. The ‘presence’ of the agent becomes a ‘pattern’ in the interactions between agents. This mediationally constituted ‘presence’ or pattern assists in defining both the agent and their agency; interactions occur in patterns created by the mediation defined by the presence (agency) of an agent.
Wertsch (1998 p15) makes the point that “there is often no simple, objective, *a priori* definition of the scene and its boundaries, a point that does not deter us from relying heavily on the notion of scene when interpreting action”. These *scenic* discussions are helpful in analysing action within them, yet they have limited ability to define potential acts. Nevertheless, the perception of the scene for the agents is essential for understanding how their actions are mediated. Burke’s (1969) claim regarding the circular nature of definitions of the elements of the Pentad (noted above) is borne out by the use of acts to assist in defining the scene. For instance, the number of messages sent to the discussion lists assists in defining the scene as ‘busy’ or ‘quiet’. Likewise, the agent, the individual student inhabiting the scene, partially defines their presence *in* the scene, which is partially defined *by* the scene. That is, while they may exist as an institutional fact (Searle 1995), ultimately individuals will construct what constitutes the scene. Hence, the analysis moves to a definition of the agent mindful that this definition will highlight other elements of the Pentad.

**5.3 Agent**

Agent, as defined by Burke (1969), is the person undertaking an act. It was further defined within the context of this research (see Chapter Two, section 2.3) as a student within the courses. Within the scene, both the student and the teachers can take distinct roles as agents undertaking a range of acts applicable to the environment and their roles (see section 5.4 for a discussion of the acts). However, here, the key focus is describing a student engaged in interaction with the online learning facilities and the technology that enables this interaction. Descriptors of agents populating the scene, described above, include their status as subscribed (or not subscribed) to the list and gender. The ways in which students can be described within the scene relate to their level of participation in the scene. For instance, some students display a high level of participative engagement, and are regarded as ‘participants’, while others whose engagement is somewhat less (being restricted to reading the messages) are defined as ‘browsers’ (Salmon, 2000) or vicarious interactors (Sutton, 2001, Hatano and Inagaki, 1991). These two roles and activities represent distinct potentials of interacting. This is because the degree to which the participants actively engage with the content and interact with it and other students is far more likely to be generative of cognitive change, than those learners who engage with the content superficially and interact with minimal engagement (Watkins, 1996). Further, as foreshadowed in Chapter Two, the
agents within this scene might be described in at least three ways. A participant refers to someone who subscribes and sends a message to the list, while a browser refers to someone who subscribes, does not post a message, but is assumed to have read the messages. A third distinction in subscribers is those who are members of teaching teams. These subscribers are perhaps better included in the scenic descriptors, as this study focuses on students and their acts, including their learning, although the acts performed by students may be influenced by teachers and, hence, teachers are also agents. Other descriptors of the agents include subscribers who are female and the students who enrolled externally. These descriptors of agents are important because the discussion list as a scene is constituted by the presence of the agents. The list has limited form before being populated by subscribers. Consequently, the characteristics of agents influence the scene and how they act within it.

Table 5.3 provides an overview of the number and percent of students (agents) in various categories within each course (scene). These categories include the number and percent of students subscribing and participating, the number and percent of female students in each of these categories, the teaching arrangements including the number of teachers, and the number and percent of external students. The number of subscribed individuals, indicated in row 1, ranged from 90 to 324. This constitutes approximately 35 percent to 76 percent of the total enrolments from each course. Consequently, not all students (agents) take up the opportunity to engage in the list activities. From this Table, it can be postulated that between 11 and 48 percent might be categorised as participants (row 3) and 20 to 27 percent as browsers (row 4).

Thus MathComp, ComProgA and ComProgC are heavily populated scenes, all having greater than 150 subscribers, whilst SQA had only 90 subscribers and is thus less populated. However, MathComp, together with SQA, had less than 60 participants (row 2). Both Programming courses had the higher number of participants (167 and 102). It is this number of participants that leads to a greater number of messages being posted, because the number of messages appears to be primarily related to the number of participants, rather than the number of subscribers. Students who are active on the discussion lists ensure that the list will be busy and potentially add to the range of interactions. Consequently, the 11 to 48 percent of students (agents) as participants adds to the interactive qualities of the scene. Both introductory courses showed a smaller proportion of subscribers who participated than the advanced courses, although
ComProgA was only marginally so (Table 5.3). As already noted, the framing of the discussion lists may have considerable impact on students’ tendency to become involved. This is particularly highlighted in MathComp. This course was framed as a ‘self help’ group, which appears to have the consequence of reducing student participation to only 30% of the students who subscribed or 11 percent of all students. SQA, on the other hand, which had no mention of the list in the course profile, had a higher proportion of participants, although the number of participants was the smallest of all courses. These students, however, had previous experience of email discussion lists and the framing of this list implied a greater expectation that students should be actively involved as participants.

<table>
<thead>
<tr>
<th>Course Identifier</th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subscribers number</td>
<td>194 (35%)</td>
<td>324 (41%)</td>
<td>161 (75%)</td>
<td>90 (69%)</td>
</tr>
<tr>
<td>Student participants</td>
<td>59 (30%)</td>
<td>167 (52%)</td>
<td>102 (63%)</td>
<td>55 (61%)</td>
</tr>
<tr>
<td>Participating students</td>
<td>11%</td>
<td>21%</td>
<td>48%</td>
<td>42%</td>
</tr>
<tr>
<td>Browsing students</td>
<td>24%</td>
<td>20%</td>
<td>27%</td>
<td>27%</td>
</tr>
<tr>
<td>Non-participants</td>
<td>65%</td>
<td>59%</td>
<td>25%</td>
<td>31%</td>
</tr>
<tr>
<td>Teaching Staff</td>
<td>8</td>
<td>11</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Sharing</td>
<td>Sequential</td>
<td>Parallel</td>
<td>Parallel</td>
<td>Parallel</td>
</tr>
<tr>
<td>External enrolments (%)</td>
<td>10.2</td>
<td>18.8</td>
<td>51.4</td>
<td>40.8</td>
</tr>
<tr>
<td>External Subscribers (%)</td>
<td>16.5</td>
<td>23.1</td>
<td>55.9</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 5.3 Descriptors of agents in the four courses

The number of teaching staff involved in the teaching team, is, in part, related to the number of students enrolled in the course, particularly where multiple campus offerings were available (see Table 5.3). It is unusual within this particular scene for an individual teacher to be responsible for the learning needs of a particular cohort of students in a course. However, the process of sharing this responsibility differed between courses. Logistics of dealing with such large numbers often requires more than one teacher, with teams of teachers dividing responsibility in a number of ways. The common ways of dividing this responsibility at the institution the courses were offered though is sequential, where one teacher takes responsibility for part of the semester (usually half) followed by another for the remainder. Another model is the parallel
team where members of the team work concurrently. Team teaching, in its various forms, assists in spreading the load. Both sequential and parallel team approaches were evident in these lists (see Table 5.3). The proportion of students who enrolled externally in the course and subscribed to the list was between 16 and 56 percent. This compares with total external enrolments of between 10 and 51 percent. This represents a significant difference \((p < 0.05)\) between the expected number of externally enrolled and subscribed students and the actual number. This difference indicates that email lists and online environments have a specific benefit for externally enrolled students, typically because of the isolation from the campus with respect to access to material and interaction, and the anywhere/anytime focus of these technologies (Jonassen, Davidson, Collins, Campbell and Haag, 1995, Riedl, 1989).

Consideration of those students whose access to on-campus facilities may be limited by distance or time provides context for the acts that may occur. As 69 students (52 percent) of respondents (Table 5.3) to the survey had access to the discussion lists from home only, there appears to be some foundation to the assumption that external students potentially benefit by this provision. In these lists, the number of external subscribers was not directly related to the proportion of all students enrolled externally, although each discussion list showed a greater proportion of external students subscribed to the lists than enrolled in the course. This suggests that external students recognised the value of lists for their learning, as in the following quotes from survey respondents which position these lists as being essential for successful completion of the course:

I think the discussion lists are a valuable learning tool and would have had trouble passing some courses without them. When you are an external student it is important to have this sort of contact with other students, it gives the feeling of belonging and also gives the opportunity to offer help or advice to others if you have it to give. [Resp. #6, ComProgC]

mainly giving assistance to those that need it, and of course receiving assistance when i need help too, that and a sort of comradary [sic]that builds from the joint exercise [Resp. #5, SQA]

Thoughts are triggered by other questions. It causes you to think about items not prev considered. [Resp. #26, ComProgA]

Provides a line of communcation [sic] to lecturers and other students for external students. Some emails posted answer questions I also had or confirm my understanding about things. It also helps to see that other students are having trouble with the same thing, and helps you guage [sic]
what level you are at. (ie If you know the answer to the question they asked)

[Resp. #50, MathComp, ComProgA]

Email discussions give students (especially external) a chance to discuss ideas/concepts of the course material [Resp. #69, SQA].

Here, the agents are enabled by contact with other students, by the engagement they experience and the reciprocal bases for interactions that assist in negotiating with and developing an understanding of the content through their activities. In this way, for these external students, the discussion list provides a basis for learning through the list interactions and activities that engage them with the content and through negotiating meaning with other students. It is this kind of interaction and engagement that is privileged in both the cognitive (De Lisi and Golbeck, 1999) and sociocultural (Rogoff, 1990, Newman et al., 1989) conceptions of learning and are indicative of emerging intersubjectivity.

In this way, external students may be more likely to be involved in and gain from involvement in online learning environments, and are also seeing the potential of discussion lists for assisting in their learning. Moreover, online learning environments which provide the kind of scene that facilitates or invites engagement in activities and interactions (acts), may well be the kinds which are generative of rich learning and, hence, intersubjectivity between agents. Here again, the relationship between the scene and the agent comes to the fore – in terms of the invitational qualities that might initiate engagement.

A further finding relates to the proportion of total enrolments in the advanced courses. Table 5.4 shows the number of students who are enrolled, subscribed and participating for all students (top), for female students (middle) and male (bottom) students. These courses have a large proportion of externally enrolled students, and a higher proportion of these students subscribed. Part of the increase in externally enrolled students in advanced courses may be related to their movement from full-time study to a work and study career. Of the 96 students who reported being engaged in paid employment, 66 (69 percent) were externally enrolled, compared with only 12 (36 percent) externally enrolled of the 33 not reporting. Thus, almost twice as many working students were enrolled externally than non-working students.
The differences in these proportions across and within these courses provide some indication of how each group acts within the scene. Overall, when combining data for all courses, 46 percent of enrolled students subscribed, while 50 percent of those subscribed participated. These two figures for all students, regardless of course, provide a baseline for comparisons between the courses. For instance, compared to the 46 percent of enrolled students subscribing, the proportion of enrolled students subscribing in each course ranges from a low of 35 percent to a high of 76 percent. Given that the overall figure is 46 percent, it would be ‘expected’ that each course would exhibit a similar pattern (all things being equal). However, the extreme differences in these figures suggests that each course (the scene) has some influence on the act of subscribing, that is each scene influences whether a student will subscribe to the discussion list. For instance, a question concerning students’ expectations of involvement with lists produced the following responses:

I never build my hopes up but it depends on the number of students in the group and participation from lectures. I must admit I would be lost without
them. You also make some friends, which you run into on other [uni] list that you may not have made as an external. [Resp. #16, SQA]

[I expect] Value added to my studies. Increased knowledge of the subject. The mailing lists can add a more personal lecturer/student contact. This is what I enjoy. This is what other UNi’s lack. Makes me feel like I'm not just a number. [Resp. #47, ComProgC]

After having been involved in an email discussion list for the first time my expectations have changed. I will now place a higher priority on the use the email discussion list when attempting to identify a solution to a problem I am encountering. First, I will attempt to solve the problem myself. Second, I will scan the existing emails to ascertain whether someone else has had similar problems and if an appropriate reply has been posted. Thirdly, I will post a question to the list, knowing that both fellow students and staff will read the question I have. [Resp. #104, ComProgA]

I stay on the lists because if I don't I think that I may miss something that may be relevant and I don't want to miss it. However, I must say that at least 90% of the messages are not useful and are just the same questions asked again and again. [Resp. #11, ComProgA]

These responses indicate the effect of the scene and its influence on students’ potential learning. Respondent #11, in particular, highlights the disjunctive nature of both positive and negative features that influence student choice to remain subscribed.

Following a similar process, the baseline of 50 percent of subscribed students participating compares with between 30 percent and 63 percent for each course. The biggest anomaly in this data is the low level of participation in MathComp as the remaining three are close to or greater than the overall proportion. Students in MathComp are less likely to both subscribe and participate in the discussion list. These acts are highly reliant on the perception students have of the scene.

The middle section of Table 5.4 displays a similar set of data for female students while the bottom section refers to male students. The overall proportions of females in the courses (16 %), subscribing (23 %) and participating (21%) again provide the basis for comparing acts undertaken by females. Added to this is the proportion of participants who are female (45%). Of these acts, the first to be considered is the act of subscribing. Comparing the proportion of female students subscribed to the proportion enrolled, only MathComp had females in close to the expected proportion. This means that the proportion of female students subscribed was similar to the proportion of female students in the course. In all other courses, a greater proportion of females were subscribed possibly indicating females perceived a greater benefit to being subscribed to
the course list. The most striking of all the data about levels of engagement of female students is the proportion of participating students who are female. In all courses, this proportion is high, given their enrolment, and subscription patterns. Forty-five percent of females who subscribed also participated, compared with 51 percent of males who subscribed and participated. Given that the proportion of females involved in the course at all levels was considerably lower than that of males, this means that female students are more likely to participate once they are subscribed. Female students commented on their participation as an integral part of their study processes as described in the following responses to the survey:

- An excellent resource that fills in the gaps that are created by not having the luxury of face to face interaction with the lecturer/other students [Resp. #23, ComProgC, SQA]
- You can get help from the lists, without having to see the lecturer. [Resp. #25, SQA]
- The more well used sites are fantastic. I wouldn't do a subject without being a part of the discussion list. [Resp. #32, ComProgC]
- I expect to get the help I need. And perhaps to be able to help someone else. [Resp. #62, ComProgC]
- A brilliant way for external students to gain additional assistance and actually feel part of the uni. [Resp. #81, ComProgA]

For these female students, the discussion lists provide an extra sense of connection with the university, their peers and their teachers.

Burke (1969 p17) noted that there is a tendency to stress the term agent, which “encourages one to be content with a very vague treatment of scene”. However, the ‘virtual’ agent within this scene becomes a vague concept, because agents are only apparent in their acts, in the patterns they create, as noted by Hayles (1999). So, for instance, an agent who posts many messages creates a visible pattern in their activity as in the case of the tutor whose presence was noted by students:

- [Lists are] Worthwhile keeping an eye on especially those that [tutor’s name] is on.

This tutor created a visible pattern that students were able to identify. Students also created patterns through committed participation, posing and answering questions as they were able. As was discussed above, the agent is defined by the act of participating and more broadly by the act of subscribing. Each individual operates almost from their
own individual scene, that is, at their computer, thereby bringing forth an initial manifestation of the ‘screenface’, that is, the process of appropriation of the technology. The act of reading, which is only vaguely represented by the above data, may further define an agent but only at the screenface, the individual scene because the presence of a ‘reader’ or browser is not felt by other participants.

In this virtual scene, the agent has been defined by their acts, an inter-relationship that will be further elaborated on in subsequent sections. However, before that occurs, the acts apparent within the (already defined) scene and undertaken by the (already defined) agents need to be elaborated separately. This is the focus of the next section.

5.4 Act

So far, two distinct types of act are evident and measurable within the online scene. One is the act of subscribing; the other is the act of participating. The act of subscribing, in effect, places the individual in the scene and has been described in the scene. The act of participating, that is sending a message to the list, being seen as part of the scene, has been partially discussed above in terms of the agent who is participating. This section focuses on the types of acts undertaken by the agents in the scene.

A consideration of the act is important for appraising the pedagogic properties of online learning environments. As proposed earlier, the kinds of activities individuals engage in have a particular form cognitive consequence (Watkins, 1996). This relates to the authenticity of the activities, that is, the questions asked are relevant to an individual’s current problems. In this way, any learning is more relevant to the individual’s zone of proximal development. That is, more than merely deploying cognitive capabilities, activities exercise and extend those capacities.

The acts of subscribing and participating have been discussed in terms of placement in the scene and as descriptors of agents. Acts can be conceptualised further by the type of activity being undertaken. These comprise asking questions, clarifying concepts and increasing understanding of topics.

The scenic aspect of the number of participants allows scrutiny of the possible reasons for the lower interactivity in some lists for, as the potential audience (subscribers) becomes larger, there is more potential for an answer from some quarter,
thus reducing the perception that larger lists are unlikely to produce a workable interactive scene as postulated by Turoff et al. (1999). Consequently, the scene influences the acts as described here. The more individuals involved in the lists (scenes), the greater the number of potential acts produced from a greater number of agents. Fahy et al. (2001) described this potential network of interactions as ‘network size’ and the actual interactions as ‘density’ (see Section 3.4.2). In this investigation, network size and density are not calculated, as the number of non-posting participants is large, thus skewing the calculated density. However, the concept of density, that is, the number reading compared to the number posting is investigated. The distinction between those posting and those only reading is salient from a cognitive viewpoint, because deeper-level mental processing and manipulation of concepts and processes is enhanced by student-to-student dialogue (Boettcher and Cartwright, 1997) and may also lead to greater intersubjectivity or shared understanding between participants.

Table 5.5 presents data on students who responded to the survey; the number and proportion of students subscribed to the list; the number and proportion of students who read messages posted to the list; and those who posted messages to the list (acts). The number of survey respondents was higher in the two very active lists (ComProgA and ComProgC) although this represents a smaller proportion of students surveyed. In effect, the successful lists (that is those with high activity) produced fewer respondents proportionately in the survey. Thirty-four students were concurrently enrolled in MathComp and ComProgA (both are first year core courses). Only eighteen students were concurrently enrolled in the advanced courses. The proportion of students who reported posting messages was around 60 percent in each course. As the proportion of subscribed students participating, noted in Table 5.3, was lower for all courses except ComProgC, the survey data over-represents participating students (agents acting). Therefore, more detailed information is gained from the participating students, but less information from less engaged, browsing students. Nevertheless, a focus on information from these students provides the type of data that allows consideration of the possible performances of students. However, the proportion of active students was close to half of the respondents, thus equally representing both groups.
The number of students reporting reading messages was consistently high with the lowest participation rate at 85 percent in SQA. This indicates that many students use the list in a browsing style thus establishing non-participative students as part of the scene, albeit a part of the background. These students are aware of the acts of the lead players and gain from their vicarious interaction with them (Sutton, 2001, Hatano and Inagaki, 1991). This view is illustrated by comments by these students reflecting the idea that information may be exchanged between active participants that could be important for their learning, providing solutions before the question is asked or even formulated and where there are various comfort levels. For instance:

[The discussion list] allows you to see answers to questions you didn't think to ask. [Resp. #21, MathComp, ComProgA]

There were questions posted to the list that I did not know the answer to and was keen to find out what the answer was and I felt that it was useful in that respect. When a question was asked that I really wanted to know I watched the list closely for an answer. [Resp. #11, ComProgA]

they are an open forum where any student can feel comfortable posting, responding or just reading messages. [Resp. #115, ComProgC, SQA]

Respondent #21 shows that students gain access to formative views of learning that may not have been available without interactions, in some ways finding out what the student did not know they did not know. Similarly, Respondent #11 highlights that access is gained to responses that provides resources that can be accessed as the learner is negotiating a particular problem. So the immediacy of the classroom environment is replaced by ongoing access to resources in the forms of consideration of issues that are relevant at that time, with relevance being determined by the agent. Respondent #115 indicates precisely the variations in the ways in which students use email discussion.
lists and that their participation permits relative anonymity for those who might be otherwise reluctant to engage in a public discussion. Indicative ways of participating, such as subscribing (browsing) and participating, are inherent in these responses as is their agency. In different ways, the three respondents refer to the knowledge required to successfully complete the course being available in a way which is accessible, not constrained by the fleeting immediacy of classroom interaction and that this supports a relationship between access to knowledge and the learner which is founded on its timeliness and appropriateness to the learner and within their current zone of proximal development (Vygotsky, 1978). That is, their learning is claimed to be supported vicariously through observation of activities of co-agents.

Table 5.6 presents data on the types of acts undertaken by students responding to the survey. These kinds of acts each have distinct pedagogic properties. Asking a question allows students to engage in knowledge construction and leads to potential co-construction through answering a question. Making general comments allows students to reflect and engage at different levels with the course content, while forming a study group leads to alternative opportunities to engage in co-construction of knowledge. This data shows that 61% of all respondents to the survey asked a question. This means that many students are not actively participating, given the definition of active participation as contributing to the ‘discussion’. A smaller percentage (43 percent) reported they actually answered questions previously asked, providing evidence of their reliance on teachers to provide correct answers. Fewer students reported making a general comment on the discussion lists (28 percent) and a very small proportion (7 percent) reported that they used the discussion list to aid in the formation of study groups. This perhaps lends weight to the assumption that the types of interactions favoured by students revolve around course specific objectives. But more generally, it points to the degree by which only a small percentage of the participants are engaging in the kinds of activities that are demanding, engaging and are likely to lead to robust learning, when taken as engagement in non-routine kinds of activities.

<table>
<thead>
<tr>
<th>Type of act</th>
<th>Number</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask a question (formulate a question)</td>
<td>79</td>
<td>61</td>
</tr>
<tr>
<td>Answer to a question (formulate a response)</td>
<td>56</td>
<td>43</td>
</tr>
<tr>
<td>Comment (formulate an observation, etc)</td>
<td>36</td>
<td>28</td>
</tr>
<tr>
<td>Study group (request a networking opportunity)</td>
<td>9</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 5.6 Types of acts reported by survey respondents
Nevertheless, those respondents to the survey not posting messages still reported positives such as:

‘being able to see what others are doing and knowing you are not the only one’ [with problems] [Resp. #22, MathComp]

Seeing others on the list having the same problems can lift your spirits as well, just knowing that your [sic] not the only one. [Resp. #57, ComProgA]

These kinds of response were common and found in a response to at least one of the questions by 50% of survey respondents. The frequency of this kind of response indicates the nature of the ‘browsing’ behaviour, that even though the list allows active participation, there is ample scope for a passive kind of participation which better suits some students but which seemingly indicates a kind of act that is indicative of low level (surface) outcomes rather than deeper learning (Boettcher and Cartwright, 1997). It is this evidence which again calls into question results of previous studies, where browsing students were not included in the analysis (Graham and Scarborough, 1999) and appears to parallel face-to-face classroom situations where some students rarely actively participate, preferring instead to watch from the sidelines. However, as studies of students from Confucian heritage cultures have shown, this apparently passive form of learning can in fact be quite active and constructive of the knowledge to be learnt (Biggs, 1996).

Students who did not respond to the question concerning answering questions reported that often their question was asked by someone else or that they only had to wait until it was posed and posted. In some ways, then, the discussion list became a ‘frequently asked questions’ facility, a resource that could be referred to at need. Two students specifically referred to the ability to utilise messages in this way, using the accumulated messages as a database of potential problems that could be encountered within the course:

I store all the subject emails, when i have a querie [sic] i can first 'search for text within this folder and that usually comes up with some relevant message or two [Resp. #60, not stated].

This kind of engagement with the messages relates to a browsing behaviour and adds to the repertoire of learning opportunities for the student. In some ways, it subverts the purpose of list provision for interactions, yet emphasises the multiplicity of ways in which students may interact with an online learning environment and gives rise to multiple forms of mediated learning.
Elements of a learning environment

Just over a quarter (28%) of students reported making a comment. This type of response may be related to the act of responding (discussed above) not directly related to questioning and thus contributed to the larger number of responding messages in some courses (as defined within this research). Messages categorised as responses were those that addressed the same issue even if not directly, which resulted in the questioning/responding categorisation rather than questioning/answering (see section 5.6).

Very few students reported using the discussion list to assist in the formation of study groups, as the analysis of archives indicated that this was one of the more frequently occurring activities in the networking category. This suggests that while formation of study groups does occur, after initial messages requesting participants for a study group, responses occur off the list between interested students as evidenced by messages of apology for sending messages meant for groups to the list. Thus, the discussion list may act as an initial contact method with the actual formation of the group occurring between the individual students.

In an online learning environment, sending an email is an act in the scene. The act of sending an email can only occur within an online environment, although it also occurs outside learning environments between individuals. Its potency as a pedagogic strategy is that it engages the learner in meaning construction with another – through inter-psychological processes (Rogoff 1990), between the individual and the social source, the first step in intersubjectivity. In this way, the kind of act in which the individual engages, whether overtly public, as in questioning, or by more internal processing, is richly associated with learning. Consequently, the degree by which the online learning environment can press the learner into engaging in this kind of activity is, presumably, a basis for considering its utility. Thus, asking questions by email is inherently part of the learning environment. Asking questions is but one part of the interaction inherent in a learning experience, just as reading and construing meaning is.

As already proposed, an essential act within this environment (scene) is sending an email. Agents have also been defined extensively. As an act cannot occur without an agent, how agents and acts define each other is central. Burke proposed that:

if an agent acts in keeping with his (sic) nature as an agent (act-agent ratio), he (sic) may change the nature of the scene accordingly (scene-act ratio), and thereby establish a state of unity between himself (sic) and his world (sic) (scene-agent ratio) (1969 p19).
This proposition is borne out within the online learning environment because the acts that students and teachers undertake affect the scene in multiple ways. The number of messages, discussed in Section 5.2, influenced the perception of a discussion list with many messages could thus be described as a ‘busy’ scene and a ‘successful’ discussion list. The agent/act ratio thus points to particular ways of understanding the scene as well as the agent and their acts.

The number of messages each subscriber sends is part of the act/agent relationship and indeed can be represented as messages per subscriber, in keeping with Burke’s notion of a ratio. That is, it indicates the frequency by which individuals engage in knowledge-building activities. Table 5.7 shows the variation in the number of messages sent by different groups in each course. In the two highly active courses, ComProgA and ComProgC, the average number of messages per subscriber was at least twice that for the other two courses (MathComp and SQA). Of those students who participated by sending a message, the average was again nearly twice as many in the highly active discussion lists. Females appeared to post more frequently than male participants and were more likely to post a message. The females in these courses appeared to be able to overcome both the inhibitory aspects of communication via technology and any disadvantage of gender in unequally represented groups (Spender, 1980). Males, on the other hand, appear to be less likely to post messages, perhaps preferring the role of ‘silent partner’, discussed below.

<table>
<thead>
<tr>
<th></th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Messages per subscriber</td>
<td>2.1</td>
<td>4.3</td>
<td>8.3</td>
<td>1.4</td>
</tr>
<tr>
<td>Messages per student</td>
<td>3.1</td>
<td>6.1</td>
<td>12.1</td>
<td>3.5</td>
</tr>
<tr>
<td>participant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Messages per female</td>
<td>3.2</td>
<td>7.9</td>
<td>15.5</td>
<td>4.3</td>
</tr>
<tr>
<td>participant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Messages per male</td>
<td>1.5</td>
<td>2.3</td>
<td>4.7</td>
<td>0.9</td>
</tr>
<tr>
<td>participant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Messages per staff</td>
<td>4.5</td>
<td>47.1</td>
<td>97.3</td>
<td>11</td>
</tr>
<tr>
<td>participant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.7 Acts performed by agents

The most notable difference is in the number of messages sent by teachers. The highest, in ComProgC, was a result of the ‘dedicated tutor’, which students commented on in the survey. Students’ appreciation of the dedicated teachers was evident. One respondent commented that the lists were indispensable but could be improved by:

Having a dedicated tutor to answer student’s questions.[Resp. #29, SQA]
while another commented:

My first experience of email lists in a university environment was this year at [university]. I find the lists probably even more valuable than my textbooks, and find on the whole that they are managed well, and that tutors and assistants are effective, friendly, dedicated, and very helpful. [Resp. #117, MathComp, ComProgA]

Other students commented on the ways in which teachers approached the list, likening the list to part of the repertoire of learning experiences provided to the students. Table 5.7, bottom row, shows the differences to which the following student refers:

Some lecturers treat it like extended classes while some treat it like a chore. [Resp. #94, ComProgC, SQA]

Approximately 10 percent of students referred in some way to inadequate participation by the teacher. This ranged from the:

‘missing in action’ [lecturer] [Resp. #23, ComProgC, SQA]

to a request that:

‘perhaps some lecturers can respond or use the lists more frequently’ [Resp. #48, SQA].

This is particularly evident in MathComp, where the teachers posted an average of fewer than 5 messages compared with greater than 50 messages per teacher in the active discussion lists.

Thus students’ perceptions of the acts permissible in this scene engage with the notion of epistemic authenticity, that is, that interactions allow them to move beyond being merely a recipient of knowledge to a consideration of knowledge as co-constructed (Valsiner, 1994). This is the active reciprocal process of knowledge construction through interaction between the social and individual. This relationship between act and scene is mutually inclusive as with many scenes. Two primary types of act were noted above – subscribing and participating. The former, subscribing, placed the agent in the scene and allowed the second to be undertaken. The acts involved in participating contributed to the scene by providing the participants with a perception of the busy-ness of the lists. The current belief that a large number of participants in an environment will be unworkable stems primarily from the perspective of assessing student learning, rather than from the learning potential of large groups. Thus, a large group where every participant is required to participate will place an extra burden on
whoever has to assess students’ participation as well as students who must interact with the list.

As noted previously, the number of participants, particularly those engaged in interaction, allows the elucidation of the possible reasons for the activity levels of certain lists. It was also noted that the framing of the list can be influential in determining what acts are permissible in the scene. The framing is an initial act undertaken by an agent (teacher), that is, the documentation of the list to students. Table 5.2 highlighted the ways in which the lists were presented to students as potential sources of help. It is noted here that those courses, which implied that help would be provided via the discussion list, were more active. Thus, ComProgA and ComProgC in which students were expected to be involved were considerably more active. This indicates that direct social practice in the form of recommendations from the tutor may have acted more effectively inter-psychologically than when only suggested in resource materials. Both MathComp and SQA were less conducive to this expectation with the former presenting the list as a ‘self help’ group and the latter not mentioning the list in the course profile. The explicit statements in both Programming courses appear to have influenced students to become involved. This is further facilitated by the approach of the teachers to the lists, with teachers in the programming lists being highly active. In these two very active lists, the descriptors which best highlight the differences between them and the two inactive lists are numbers of participants and the number of messages – both indicators of the success of the list – and the framing. The framing appears to influence both the number of participants and the number of messages, which suggests that framing is perhaps the most significant indicator of the potential success of these lists. If the framing is conducive to the purpose of learning and gaining support, then the ‘scene is set’ for the acts that may lead to the kinds of learning intended by the teachers. This leads to the envisioning of a ‘learning community’ in which members are active and acknowledged, and guided by their teacher. The assumption underlying this is that the teachers view the lists and, consequently, enact their roles, in very different ways.

This acknowledgement is further demonstrated by the ways in which students address other members of the learning community. Thus, messages were assessed for students’/teachers’ salutations and valedictions. Participants commenced messages in one of four ways: (i) a general greeting (e.g. “Hi everyone”); (ii) a greeting to a specific
individual (e.g. “Hello [name]”); (iii) a greeting to multiple individuals (e.g. “Name (and Name)”); or (iv) with no specific opening. In a similar manner, participants closed their messages in one of four ways: (i) a closing word or phrase (e.g. regards or thank you); (ii) their name; (iii) both a phrase and their name, or (iv) with no closing phrase.

Table 5.8 shows the form the opening of messages took for each of the four courses, from a general greeting to all students, a greeting to one or more specific students, or with no opening statement. The most significant aspect of this data is that ComProgC students were consistent users of openings, and more frequently used a greeting to multiple students. All other groups tended to not use multiple greetings. ComProgC students also more frequently used a greeting to a specific individual. This form of greeting accounted for more than 50 percent of messages to that list. SQA and MathComp both had around 50 percent of messages without a greeting, perhaps indicating that students in these groups were less likely to recognise individuals and, hence, providing an indication of group dynamics. The essence of this is that a collegial atmosphere of individuals working together was less likely to form, whereas in ComProgA and more so in SQA there was a sense of the group and particularly of individuals within the group. The consequences for learning are that knowledge becomes shared amongst list members, better facilitating the emergence of intersubjectivity because the individuals are known rather than being vaguely identified email addresses.

<table>
<thead>
<tr>
<th>Salutation</th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>34.2</td>
<td>25.9</td>
<td>17</td>
<td>28.3</td>
</tr>
<tr>
<td>Specific</td>
<td>16.4</td>
<td>33.1</td>
<td>52.3</td>
<td>19</td>
</tr>
<tr>
<td>Multiple specific</td>
<td>0.9</td>
<td>1</td>
<td>10.3</td>
<td>0</td>
</tr>
<tr>
<td>None</td>
<td>48.4</td>
<td>40</td>
<td>20.4</td>
<td>52.7</td>
</tr>
</tbody>
</table>

Table 5.8 Proportion of messages using salutations

Forms of greeting might be seen as being akin to the glances round the classroom, looking directly at people to whom a question is addressed, adding a sense of collegiality and of group membership. In the online environment, this is referred to as the “interpersonalization” (Walther, 1996). In this way, greetings identify to whom the question or response is directed and provide a sense of continuity to discussions being undertaken. This sense of continuity is perhaps a central feature often missing in online learning environments due to its asynchronous nature. Students’ use of openings,
particularly those for whom the environment is less ‘new’, provides a way around the
disjunctive nature of asynchronous interactions. The consequences for learning here
include connections being made between participants leading to social recognition and
the potential for intersubjectivity.

The closings, on the other hand, showed less easily interpreted differences. Table
5.9 displays the types of closing used by students. These include using their name,
and/or a phrase (e.g. Regards Alison) or no closing. For instance, ComProgC showed
the highest usage of both a closing and the inclusion of the name of the sender, thus
indicating that individuals may be identifying as a member of the group. The next
highest usage occurred in MathComp. Students in SQA were more likely to use a
simple closing without identifying themselves, while those in ComProgC were less
likely to simply identify themselves or to include a closing at all. Thus, the use of
openings and closing was not identified to follow any established pattern in this
research, and may relate more to the individual rather than to the group. Consequently,
a student may use a closing based on individual perceptions rather than as an attempt to
foster a relationship between group members.

<table>
<thead>
<tr>
<th>Valediction</th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>29.3</td>
<td>34.4</td>
<td>12.6</td>
<td>35.3</td>
</tr>
<tr>
<td>Closing</td>
<td>4</td>
<td>4.6</td>
<td>3.2</td>
<td>16.4</td>
</tr>
<tr>
<td>Both</td>
<td>45.3</td>
<td>36.5</td>
<td>73.8</td>
<td>24.4</td>
</tr>
<tr>
<td>None</td>
<td>21.3</td>
<td>24.4</td>
<td>10.4</td>
<td>23.9</td>
</tr>
</tbody>
</table>

Table 5.9  Proportion of messages using closing

The salutations and valedictions provide a sense of recognition between individual
members of the list and hence may also contribute to a feeling of community. The most
consistent users of salutations and valedictions in messages were advanced students in
the high activity list, which may contribute to the apparent success of this list. However, students in the high activity introductory course were the least frequent users
of a closing, so the apparent success of this list may be attributable more to the sense of
community established through the framing, as discussed above, and the use of
openings. This sense of individuality implies that the agent/scene relationship may hold
more potential for describing some parameters.

The sense of community was evident with 70 percent of respondents to the survey
claiming to feel part of the learning community. Those who did not pointed to reasons
of not posting as contributing to this lack of a sense of community. Thus students are aware of the differences between participants and browsers.

The potential acts that can be accomplished by agents in any scene are affected by a number of issues. One potential issue in a learning environment, or other public interaction forum, is communication anxiety (Brown and Vician, 1995, McCroskey, 1970). The survey specifically addressed this issue, as there is a general perception that information technologists are ‘geeks’ or the ‘nerds’ who are less communicative. Student responses to the communication anxiety questions indicated that they were within the normal range for college students. This means that there is no overt reason for students to not participate based on anxiety arising from communicating in a public forum. Despite this, there was a belief amongst students that posting messages was daunting or intimidating, reported by 12 students (9.2 percent), thereby inhibiting their participation. Consequently, the environment has the effect of reducing potential acts by some individuals. This effect on agency will be discussed in the next section.

The acts within the online scene have a reasonably consistent manifestation across the four courses being investigated. Each course showed slightly different levels of interaction, with the programming courses providing a helpful resource while MathComp and SQA were less conducive to interaction and thus learning. The emphasis on questioning was confirmed by respondents to the survey, with a greater proportion undertaking this kind of act. Questioning likely engages the learner in considering and constructing propositions, according to constructivist theory (Jonassen et al., 1995). It potentially has the capacity to extend their knowledge. Fewer students reported responding to questions, perhaps because teachers tend to account for many instances of this act. Consequently, this suggests that students may be less likely to offer an opinion or other forms of knowledge where they are unsure of the correctness of their answer. Students expressed this anxiety in the following ways:

The feeling of outright vulnerability (don't want to ask stupid questions syndrome) [Resp. #23, ComProgC, SQA]

The fact that others may ask questions that you are too scared to ask because you think you may appear stupid. [Resp. #81, ComProgA]

I find posting very daunting - when i see the level of questions/answers of other students, i am even less inclined to post because the questions i do have seem so basic and i feel so stupid. [Resp. #4, MathComp, ComProgA]
The ‘don’t want to ask stupid questions syndrome’ may be akin to communication anxiety, a form of ‘knowledge anxiety’, which manifests itself in a fear of posting questions. This has implications for the agency of the students, that is, how they approach learning opportunities.

### 5.5 Agency

Agency in this research relates to how the learner (agent) engages in structured processes (acts) that assist in their learning within an online scene. This includes how individual students participate and how the group interacts. In effect, subscribing and participating in electronic lists relate to agency at both an individual and a group level. Engagement relates to two kinds of agency, that is, having access to the means and to using it. Access is provided by subscribing to the list as a potential source of information, the learning materials, and is a part of the repertoire of learning activities because it requires undertaking a conscious and goal-directed act. Subscribing allows participation, using the means, and gives access to a deeper level of agency – that of actively constructing knowledge through shared insights – intersubjectivity. Agency can be indicated by both the number of messages and by the frequency of posts. Agency as defined by Burke (1969), is the ‘how’ of an activity, which allows subscribing and participating to be seen as part of the ‘how’ of student engagement. In other words, agency is the exercise of agents’ actions and the intentionality that is exercised in the participation of list-based activities. Insights about agency are also available from responses to the survey in which students describe the ways they use the lists.

The frequency of reading and posting as reported by respondents in the survey is displayed in Table 5.10a and b. The majority of students regularly read messages from the discussion lists while very few reported posting messages to the list. This data represents the perception of the frequency with which students utilised the discussion list and provides understanding of how students use the list and, hence, underscores agency. For the majority of students (more than 75 percent), the list represents another resource for gaining information about the course, but not necessarily a method for interaction. In some ways, using the discussion list, particularly to ask questions, is not a regular part of their study activity. Less than a quarter of students reported regularly (weekly and more frequently) posting to the list (see Table 5.10b). This is perhaps the
most telling measurement in terms of the external, top-down push towards online
learning environments. While many students are using the discussion lists in limited
ways, the number that are appropriating it, that is enacting the reconstruction of the
knowledge as a result of these interactions (Wertsch 1998) and integrating it into their
learning repertoire appears to be small (less than one quarter of students).

<table>
<thead>
<tr>
<th>Frequency</th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily or more frequently</td>
<td>27</td>
<td>47</td>
<td>33</td>
<td>19</td>
</tr>
<tr>
<td>Several times a week/weekly</td>
<td>9</td>
<td>15</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Occasionally</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>65</td>
<td>44</td>
<td>29</td>
</tr>
<tr>
<td>Proportion reading at least daily (%)</td>
<td>69</td>
<td>71</td>
<td>70</td>
<td>56</td>
</tr>
<tr>
<td>Proportion reading at least weekly (%)</td>
<td>92</td>
<td>94</td>
<td>87</td>
<td>74</td>
</tr>
</tbody>
</table>

Table 5.10  Frequency of reading and posting messages

Despite the limited numbers of students who are appropriating the technology into
their everyday learning activities, a number of students who responded to the survey
reported very positive outcomes. For instance, one student reported at length about the
changes brought by email discussion lists and the consequent implication for their
learning as follows:

… this is my second degree and when I completed my first we didn’t have
access to e-mail. E-mail list have changed the way I study and give me
more time to do, rather then spending hours working out annoying problems
which every one else is having too eg. problems with a software package
which turn out to be bugs not a part of the learning process. [Resp. #16,
SQA]

This student is demonstrating the potential of discussion lists for reducing problems
encountered when studying at a distance from the university. Each problem
encountered with software, which could easily be addressed by teachers and classmates
during class, is addressed within the list messages, allowing students to reduce the amount of time spent on non-relevant problems. This is essentially the goal in planning for online learning environments, that students will gain access to a greater range of resources for their learning.

Another parallel aspect of list participation as a resource that provides strategies for learning is provided by the following students:

I store all the subject emails, when i have a querie [sic] i can first 'search for text within this folder and that usually comes up with some relevant message or two. [Resp. #60, not stated]

An email discussion list allows you to review emails that have already been posted and to identify if a solution to your problem or similar has already been posted. When posting to an email discussion list you are not directing the question to any one in particular: information leading to the correct solution can come from a lecturer, tutor or another student. [Resp. #106, ComProgA]

This kind of use of email discussion lists may provide a deeper sense of agency for some students whose learning is facilitated by the interactions without necessarily interacting. Browsers of list messages are exhibiting a level of interaction with the list that includes them. As previously mentioned, some research (e.g. Graham and Scarborough, 1999) excluded those students who were deemed ‘lurkers’, referred to as ‘browsers’ or vicarious learners here, as they did not contribute to the environment. These students appeared to participate peripherally, without posting messages which could further their levels of engagement. However, the findings here indicate that these students benefit considerably from engagement with the lists and consider themselves to be a part of the ‘group’:

It's the only contact I have with other students and the faculty. Even though I am mostly a 'silent partner', I still benefit from being part of these lists. [Resp. #89, ComProgC]

Use of the term 'partner' evokes a sense of connection and participation even though the engagement with the list is passive rather than active. Many active students are also aware of this passive role, in which each student acts and/or responds, as necessary for their own learning. The passive/active distinction is not easily measurable in an online environment. Active learners may appear passive online, as demonstrated by the following response:
I've never once posted an e-mail in the list. Not because I did not want to but the need never arose. Most of my questions were usually asked already and answered. [Resp. #71, ComProgC]

Conversely, there are many negative aspects to a student’s active engagement with a list. The following response, for instance, indicates some of the problems of participation:

The few responses that I have had from lecturers have been useless. Not very helpful at all and sometimes demeaning. Not at all confidence building. No constructive tuition. This is difficult when my main source of interaction with fellow students and lecturer is via email. Considering that all we are trying to do is understand and pass a subject. I understand that lecturers are busy people but sometimes the short and criptic [sic] responses are a waste of time and energy. [Resp. #116, MathComp, ComProgA]

The implication of this comment is that participation can impact negatively on the agency of students and that there may be contradictory purposes between student learners and teachers. These kinds of interactions may not be helpful in securing a learner’s goals and may negate the sense of ‘self’ that could be supported through a distance mode of learning. Consequently, teachers who view the list as ‘self-help’ for students are perhaps negating the learning potential of lists. Self-help demands too much agency from students, particularly for the novice. Teachers who view the discussion list more as a forum from which to receive help from a variety of sources, frame the list in different thus ways providing different levels of agency for students. Students’ constructive actions should not be epistemological adventures without form or purpose as can be the case in a ‘self-help’ group. Guidance is necessary, particularly in a first year course and may not be evident when help is framed as being from the novice rather than from a knowledgeable expert.

The agency of the student may be facilitated or undermined by the scenic parameters of list framing, but can also be structured in multiple ways. The passive form of agency, of browsing messages rather than actively posting messages, is perhaps an important aspect which allows students epistemic authenticity based on the form of mediation that is best suited to their style of learning and that best engages them with the content material. Thus the purpose for engagement may be highly influential in determining the agency of the student.
5.6 Purpose

Purpose was defined in Chapter Two as ‘learning’ and which decreases in scope to completing an assignment with a passing mark. The university purpose of providing the list is openly stated as providing opportunities for interaction to assist in student learning. However, this purpose is not necessarily shared by or commonly construed by participants. For some students, the purpose of becoming involved may be more focused and precise and often related to the immediacy of problems in their zone of proximal development (Vygotsky, 1978). The genres of the speech acts in an email are related to the purpose of the message. For other students, the purpose of an act, such as posting a message relates directly to the current problem rather than the larger purpose of study.

The purposes of the acts (e.g. sending an email) in the discussion list were identified in Chapter Three (see Tables 3.3 and 3.4). The functional categories of questioning and responding were the main focus, with other functions evident as well. Questioning and responding were further analysed for specific subcategories. Each category allows for acts that students undertake within the scene to be described in a coherent way, while the sub-categories further define the types of questions and responses that were common in interactions.

In these lists, interactivity stems primarily from the interrelated categories of questioning and responding. Table 5.11 indicates the numbers of messages in the categories of questioning and responding and the frequency of these in each sub-category. The numbers in bold refer to the total number of questioning and responding to messages. The act of questioning invites a response and gives rise to the potential for interactivity between individuals. However, not all questions elicited a response. This is clearly demonstrated in Table 5.11 by reference to MathComp. Here, the total number of responses is less than the number of questions. All other courses show a greater total number of responses per question in the order of one response per question (SQA), to nearly two responses for every question (ComProgC). The importance of this is that students are less likely to respond to questions, if there is no facility for correcting mistakes that comes through dedicated involvement by a teacher. The framing, as described above, may also contribute to the low responding rate in MathComp, as students may be less likely to participate where this help may not be forthcoming. The equivalent scenario in a face-to-face situation is providing a room for
class members to get together with no tutorial help. Students attend tutorial sessions for a variety of reasons; the chief among them being to gain help or to achieve a grade for attendance. Where there is no grade allocated for attendance or participation, the chief reason for attendance is to gain assistance with course material or assignments. As many students feel unqualified to answer questions for which they do not know the answer, particularly in introductory courses, the response rate may be considerably less as is demonstrated in MathComp. ComProgC, on the other hand, had a tutor who responded at a high rate, which allowed students to respond with some confidence that any misconceptions they had would be corrected by the tutor, thus further facilitating their learning.

<table>
<thead>
<tr>
<th></th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Question</td>
<td>Response</td>
<td>Question</td>
<td>Response</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>99</td>
<td>90</td>
<td>465</td>
<td>792</td>
</tr>
<tr>
<td>Content</td>
<td>44</td>
<td>26</td>
<td>247</td>
<td>312</td>
</tr>
<tr>
<td>Networking</td>
<td>4</td>
<td>4</td>
<td>32</td>
<td>73</td>
</tr>
<tr>
<td>Assessment</td>
<td>22</td>
<td>19</td>
<td>98</td>
<td>176</td>
</tr>
<tr>
<td>Non-content</td>
<td>20</td>
<td>14</td>
<td>79</td>
<td>154</td>
</tr>
<tr>
<td>Study</td>
<td>24</td>
<td>15</td>
<td>27</td>
<td>57</td>
</tr>
<tr>
<td>List</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Clarification</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tips</td>
<td>9</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistance</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confirmation</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.11 Categories and sub-categories of questioning and responding

The previously highlighted differences between the number of participants and the number of messages become further elucidated by the differences in questioning and responding subcategories. In both high activity lists, the number of responses is far greater than the number of questions. In the low activity lists, there are some questions that apparently have not been addressed in the list (see above).

The differences in interactivity between the lists are demonstrated by ComProgA and ComProgC having a greater number of responses than questions in nearly all subcategories when compared with MathComp and SQA. For instance, both programming courses had numerous responses for each question in nearly all categories. The sub-category, ‘content’, relating specifically to the objectives of the course, showed more
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responses than questions, as did ‘assessment’, ‘non-content’, and ‘study’. The exception to this pattern is ‘networking’ in the ComProgC course, which had fewer responses than questions. ‘Networking’ messages allowed the participants to establish links between individuals and to work towards community building, based on shared experience and including instances of the formation of study groups. Many of these discussions were taken off the list as indicated by the error messages where students accidentally sent messages meant for individuals to the list. These error messages often apologised for posting a message to the list that was meant for an individual. ‘Networking’ interactions were often part of another interaction and included the following types of responses, particularly for fellow students who have indicated problems:

I think I speak for most students as up-coming programmers that we appreciate your support that you have demonstrated on this list and we thank you very much. But some of us have a point and I am one who is trying to absorb this material as fast as I can but at the same time understand the principles behind it in the time period we have. but we will presevere! [ComProgA]

I sympathise with everything that you said, but don't give up. Think about why you started this subject and how much effort you have put into it so far. It would be a shame to throw the whole thing away now. Try asking for a re-mark of your past assignments and also for an extension on this one. [help list] can help you alot. I feel like my situation with ass3 is totally hopless [sic]. I am so far behind in this assignment it is staggering, but there is no way I am going to let it beat me, not without a fight. [ComProgA]

These kinds of interactions show a high level of support for the study process. Students who share their experiences on the list in this manner are providing the nudge, the sympathetic ear, to other students who may be feeling overwhelmed by the process of engaging in learning new skills. Advanced students, however, appeared to take private networking activities off the list, or engage in the more rhetorical kind of networking activities which often did not require a response such as:

When are they going to make compilers clever enough to predict what programmer want???? [ComProgC]

In both the low activity courses (MathComp and SQA), the number of responses was almost consistently lower than the number of questions. For instance, in the sub-category of content in MathComp, there were only 26 responses to 44 questions, a ratio of 0.59 responses per question, while both ComProgA and ComProgC had greater than 1.25 responses per question. SQA achieved 1.07 responses per question, in effect a
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response for each question. The limited question/response ratio, particularly in MathComp, means that students do not gain information they require for their learning. As a source of information that contributes to learning then, the list is not meeting the students’ expectations or needs and is thus potentially viewed in a negative manner by the students. In an environment that purports to provide help where no help is forthcoming, students may not participate and become disillusioned with both the course and the online learning environment such as the following comment in the survey:

i didn't find it valuable - it would be easier to just phone the lecturer. [Resp. #73, ComProgA]

In MathComp, only two sub-categories displayed an equal or greater number of responses than questions. These were the ancillary functions of ‘networking’ (equal numbers) and ‘list’. The ‘networking’ sub-category allowed students to connect with their peers while the ‘list’ category allowed students to question the workings of the discussion lists. This latter sub-category did not appear in the SQA course, perhaps due to the experience of previous discussion lists that students in this course may have had. Notably, this course also had very few responses to questions about ‘assessment’ while ‘content’ had slightly more responses than questions. The only category in which responses were greater than questions was ‘non-content’, which in this case related to the workings of a program, the use of which was necessary for the course but not a part of the course objectives.

The remaining categories and their frequencies are outlined in Table 5.12. ‘Observations’ are generalised statements about the course, such as:

Hi Everyone, I agree with [tutor] Tic Tac Toe was never this hard! [ComProgA]

Hey ! i have to tell someone ! :]
i'm finally getting the knack of this ![ComProgA]

These more frequently occurred in the ComProgA and ComProgC courses, both of which were framed in such a way as to provide a greater level of potential help for participants (see Scene section 5.2). This framing appears to have permitted students to engage in activities that contribute to the perceived notion of a community of learners. This is also demonstrated by the number of messages that included ‘humour’ – the typical joke emails which are frequently passed around various groups. The level of
‘thanking’ exhibited also demonstrates the apparent collegiate nature of these two discussion lists. Many of these messages again focused on the collegiate and community building concepts, for instance:

Thanks everyone for their help with assignment 1 [MathComp].

<table>
<thead>
<tr>
<th>Total</th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>34</td>
<td>25</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>Humour</td>
<td>1</td>
<td>53</td>
<td>47</td>
<td>3</td>
</tr>
<tr>
<td>Thanking</td>
<td>2</td>
<td>62</td>
<td>69</td>
<td>2</td>
</tr>
<tr>
<td>Informing</td>
<td>28</td>
<td>73</td>
<td>59</td>
<td>11</td>
</tr>
<tr>
<td>Testing</td>
<td>2</td>
<td>6</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>Repeat</td>
<td>1</td>
<td>37</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>Error (including spam)</td>
<td>63</td>
<td>14</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Forwarded</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flame</td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
</tbody>
</table>

Table 5.12 Other categories of messages

‘Informing’ messages were more frequently posted by teachers and were to inform students about changes in requirements, reminders about due dates and other course-related information such as:

Guys, Hi.
Just received a bounced message from the list server. There is a limit size of 4K on any posting to the list. You will have to send any larger files to other students directly.
The limit is in place because it takes a while to download a large file over a modem. So, if you are not interested in the file, it is a bit painful.
Also, it can put a hole in network resources.
By the way, thanks to those who have already started to help others on the list. It’s one of the nicest aspects of the computing community that so many folk are willing to help others over the hurdles they’ve managed to survive themselves. Welcome to that community. Your contributions are greatly appreciated.
[Course coordinator – ComProgA]

While both ComProgA and ComProgC had high numbers of these messages, the proportion of ‘informing’ of messages in MathComp was twice that in all other lists, indicating a purpose other than described in the framing of the discussion list, that is, the teacher may use the list to inform students of changes, remind them of due dates and so on rather than being an interactive part of the learning environment.
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Messages detracting from the utility of the discussion lists (Table 5.12) included ‘repeat’ messages, ‘testing’ messages, ‘forwarded’ messages, those sent to the list in ‘error’ (including spam messages, which are generally unwanted anywhere) and ‘flames’. ‘Repeat’ messages were generally sent by students whose messages appeared to fail to be delivered due to various reasons. It is not uncommon for delays in message relay, regardless of the expectation of instant transmission by electronic means. Anecdotal evidence suggests delays of between six weeks and six months are possible but rare. When a message did not appear, the student often reposted in an attempt to get a prompt reply. ‘Testing’ messages were often also of this nature. Students who were unsure of the success of their subscription tended to post these kinds of messages, although in some lists this was combined with a general greeting to those already subscribed. ‘Error’ messages were often sent to either the wrong list or to the list instead of an individual. This occasionally resulted in an apology message which was also counted as an ‘error’. ‘Flame’ messages were only evident on one list, ComProgA, which is possibly due to its high volume and relatively inexperienced participants.

At the level of assisting in learning within the course, a measure of the relative importance of being involved and its contribution to learning is gained by investigating pass rates of students related to subscription patterns. For the purpose of a broad analysis, all passing marks are aggregated including those of students not subscribed to the lists. Table 5.13 demonstrates the relationship between subscribing and passing. For each course, students are categorised as subscribed and not subscribed. Students were further categorised as receiving a pass and not receiving a pass (fail). This provides an indication of the proportion of students for whom list membership was positive. These numbers include students who withdrew from the course and, therefore, are slightly higher than numbers reported elsewhere in this research. Withdrawn students are awarded a fail mark, consequently contributing to the overall perception of the value of the list for the purpose of learning.
Table 5.13 Number of students passing and failing courses based on subscription to email discussion lists

<table>
<thead>
<tr>
<th>Status</th>
<th>Grade</th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not subscribed</td>
<td>Fail</td>
<td>212</td>
<td>362</td>
<td>73</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(34%)</td>
<td>(37%)</td>
<td>(27%)</td>
<td>(25%)</td>
</tr>
<tr>
<td></td>
<td>Pass</td>
<td>213</td>
<td>249</td>
<td>25</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(34%)</td>
<td>(26%)</td>
<td>(9%)</td>
<td>(17%)</td>
</tr>
<tr>
<td>Subscribed</td>
<td>Fail</td>
<td>50</td>
<td>107</td>
<td>43</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8%)</td>
<td>(11%)</td>
<td>(16%)</td>
<td>(10%)</td>
</tr>
<tr>
<td></td>
<td>Pass</td>
<td>156</td>
<td>248</td>
<td>132</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(25%)</td>
<td>(26%)</td>
<td>(48%)</td>
<td>(48%)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>631</td>
<td>966</td>
<td>273</td>
<td>163</td>
</tr>
</tbody>
</table>

While there is very little difference in the number of students passing and failing for students not subscribed in MathComp, in all other courses, the number of students not subscribed, who fail, far outweighs the number who pass (not subscribed). Conversely in all courses, the number of students failing amongst the subscribed students was considerably lower. This can be interpreted as an influence of subscription on passing, however, this may not be causal, but rather related to students' motivation to engage. Students who are highly motivated to pass will take all opportunities provided to ensure a successful outcome. Student responses to the survey included a direct link between successfully completing the course and participation for one student as follows:

I think they are an invaluable tool. You can anonymously ask really dumb questions and people help, rather than ridicule you. Without this "external" would mean "FAIL" in my book... [Resp. #7, ComProgC]

Another statement was more general:

anything that helps me pass [Resp. #43, MathComp]

These students recognise the value of the list and related it directly to the purpose of their involvement. Their expectations were that list participation influenced their ability to learn and to fulfil the requirements of the course. Other students felt that ‘help with problems’ was the main purpose of the lists, although some students elaborated as follows:

Good resource for getting help on what is relevant[sic] at this moment [Resp. #100, SQA]

Often this is the only contact you have. Other students are also a great help. [Resp. #80, ComProgA]

Answers to questions. Clarification of ambiguities. The chance to assist others. Sharing of trouble, thoughts and ideas with people having similar interests. [Resp. #55, ComProgC]
These responses sum up many of the concepts that students reported concerning their purpose of involvement in the lists and indicate an emerging concept of intersubjectivity. The sense that there is a social aspect to involvement in both university study and to subscription to lists is a common theme:

I never build my hopes up but it depends on the number of students in the group and participation from lectures [sic]. I must admit I would be lost without them. You also make some friends, which you run into on other [uni] list that you may not have made as an external. [Resp. #16, SQA]

A further theme to the kinds of purpose is related to agency, specifically, to how students become involved in their studies and the university.

Value added to my studies. Increased knowledge of the subject. The mailing lists can add a more personal lecturer/student contact. This is what I enjoy. This is what other UNi's lack. Makes me feel like I'm not just a number. [Resp. #47, SQA]

This particular response shows the appreciation of both the anywhere/anytime aspect of online learning environments (scene) and the increased perception of agency by the student. Another positive aspect of involvement and the increased sense of agency for students is related to its conception as a scene, for instance, the classroom analogy as discussed in Section 5.2.

However, there were negative perceptions about the purpose of lists and with being involved. A number of students viewed the incoming messages as ‘spam’ or useless information. The following response highlights the problem of the overuse of discussion lists by students unsure of the protocol for asking questions:

I stay on the lists because if I don't I think that I may miss something that may be relevant and I don't want to miss it. However, I must say that at least 90% of the messages are not useful and are just the same questions asked again and again. [Resp. #11, ComProgA]

Thus, this student is aware of the disjunctive nature of help via an email discussion list. The sense that something may be missed by non-involvement has to be weighed against the problems of dealing with a large number of messages. One of the ways in which sense is made of large numbers of messages is the conversation.

5.6.1 Purposeful interactions - conversations

A conversation is a set of acts in a scene with a purpose. Conversations allow participants to interact in ongoing ways to ensure the purpose of the discussion list is
met. Conversations are indicative of the serious epistemic roles that students may undertake. They allow students to engage in sharing understandings that lead to intersubjectivity. While not every dialogue will result in intersubjectivity, the likelihood of it occurring increases as students interact in enduring ways. Conversations between participants are indicative of this potential. Piburn and Middleton (1998) indicate that conversations shift the accountability for constructing knowledge from teachers to students.

Table 5.14 shows the number of conversations (interconnected acts) for each discussion list (scene). Each discussion can be a series of questions and responses as outlined in Figure 3.1. The highly active lists (ComProgA and ComProgC) showed more than 4 times as many distinct conversations as either MathComp or SQA. Further, the average number of messages per conversations was greater in both programming courses. ComProgC showed a high level of engagement between participants with an average of 4.2 messages per conversation.

<table>
<thead>
<tr>
<th>Course</th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of conversations</td>
<td>100</td>
<td>513</td>
<td>443</td>
<td>90</td>
</tr>
<tr>
<td>Total no. of messages</td>
<td>204</td>
<td>1459</td>
<td>1857</td>
<td>208</td>
</tr>
<tr>
<td>Average no. of messages per conversation</td>
<td>2</td>
<td>2.8</td>
<td>4.2</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Table 5.14  Conversations in discussion lists

As each conversation can be regarded as a topic, Table 5.15 shows the number of messages (acts) in each conversation (i.e. message in topic). The first row provides an indication of announcements for which there was no expectation of a response, while messages at level one are questions and/or comments that received no response. The messages beyond level one indicates the number of messages that referred to the initial message as depicted in Figure 3.1. The most common scenario from this was a question and single response shown by the number of Level 2 conversations, with the exception of MathComp. This course also had a high number of messages with no response with slightly more than one third of the level one posts resulting in a response. All other courses exhibited more interactions beyond the first level. A further percentage of the single messages belonged to the observation and other functions as described above. Thus, each act (e.g. message) enables or constrains other acts.
The longest conversations ranged from 12 messages for MathComp and SQA to 29 messages for ComProgC. The longest conversation for ComProgA was 27 messages. These long conversations were rare, with only one reaching these lengths in each course. The majority of the conversations were less than 14 messages long. These long interactions are examples of the potential for building intersubjectivity. However, intersubjectivity may not occur in the full sense (Gergen, 1994), although there is more likelihood of a shared understanding occurring within these interactions. Respondent #31, below, shows the perception of a student to concepts of engagement and interaction. These are the processes that may lead to intersubjectivity between participants.

[ComProgC] is the best group I have ever participated in. It is highly interactive, and is made much more so by very active participation of the lecturer [name]. I see these lists as a very valuable tool that assists in reducing isolation and contributes to my progress through my degree. [Resp. #31, MathComp, ComProgA]

Similarly Respondent #93 proposes the ways in which students are negotiating the isolating effects of distance education and the ways in which the discussion lists are used. For this student (agent), a discussion group (scene) represents the opportunity to engage in discussion and to move towards intersubjectivity with co-learners (co-agents).

One is able to read questions posed by other students and the answers given, sometimes by lecturers. Answering other's questions helps your knowledge to "gel" in your own mind. If you can explain something to someone then you understand it. As an external student if you are not in a study group you do not get that opportunity […] Another valuable aspect is that the
discussions, questions and answers are archived and are easily located for reference throughout the semester. [Resp. #93, ComProgC]

This response suggests that not only is the ability to ask questions (act) central to their learning, but that these opportunities are enhanced by the opportunity to engage in long conversations about a topic. Following on, the depth of conversations, that is, the interconnected sets where more than one individual responds to a previous message, also enhances the ability of students to engage in processes central to their learning.

Table 5.16 shows the level at which conversations terminated, that is the longest connected set of messages for each course reflect the depth of the conversations. These branching conversations—those which elaborate sub-issues which themselves generate separate conversations and wherein more than two participants (agents) interact, are common. The deepest set for each discussion list ranged from 6 for MathComp and SQA to 10 for ComProgC and 11 for ComProgA. This again demonstrates that the programming courses (scenes) had a higher level of engagement by students.

<table>
<thead>
<tr>
<th>Topic terminated at</th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Level 1</td>
<td>53</td>
<td>53</td>
<td>137</td>
<td>27</td>
</tr>
<tr>
<td>Level 2</td>
<td>31</td>
<td>31</td>
<td>235</td>
<td>46</td>
</tr>
<tr>
<td>Level 3</td>
<td>9</td>
<td>9</td>
<td>85</td>
<td>17</td>
</tr>
<tr>
<td>Level 4</td>
<td>4</td>
<td>4</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>Level 5</td>
<td>2</td>
<td>2</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Level 5+</td>
<td>1</td>
<td>1</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Deepest</td>
<td>6</td>
<td>11</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>513</td>
<td>443</td>
<td>90</td>
</tr>
</tbody>
</table>

Table 5.16 Depth of conversation

The frequency of deep conversations, that is those with many messages—differed markedly across the four courses (scene). MathComp had very few conversations in which there was more than one message. Only 16 percent of conversations were deeper than two messages. This is contrasted with 28 percent of conversations deeper than two messages in ComProgA, 48 percent in ComProgC, and 24 percent in SQA. Thus, there is more interaction in ComProgA than all other courses, with MathComp being particularly non-interactive, leading to the conclusion that not all scenes provide equal opportunity for agents to act.
Respondent #34 and Respondent #6 suggest an awareness of the kinds of activities (acts) that lead to intersubjectivity through the process of engagement and interaction on multiple levels. Respondent #6, in particular, identifies multiple sources for gaining information regarding problem solving and information sharing:

[I expect] That I will be presented with an opportunity to engage in a process of being helped, and sometimes helping others. To use information sharing. [Resp. #34, ComProgA]

I expect to be able to discuss problems with fellow students and receive [sic] feedback and updates from the course lecturer. [Resp. #6, ComProgC]

These students (agents) demonstrate the usefulness of the multiple interactions (acts) available in an email discussion list (scene). That each message may be receiving a response from different sources (co-agents) gives an added dimension to their learning. In consideration of the multiple sources of response, the instigator (agent) of conversations is relevant to the kinds of interactions that can be produced.

Table 5.17 shows the number and proportion of conversations (acts) started by various groups (agents) in the courses (scenes). In all courses, the majority of conversations were started by students, with females starting more than the expected number of conversations given their numbers. This is particularly evident in SQA where females accounted for approximately one quarter of the participants, yet started more than a third of the conversations.

<table>
<thead>
<tr>
<th>Instigator</th>
<th>MathComp</th>
<th>ComProgA</th>
<th>ComProgC</th>
<th>SQA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (%)</td>
<td>72 (72)</td>
<td>328 (65)</td>
<td>306 (69)</td>
<td>55 (61)</td>
</tr>
<tr>
<td>Female (%)</td>
<td>17 (17)</td>
<td>128 (25)</td>
<td>113 (26)</td>
<td>31 (34)</td>
</tr>
<tr>
<td>Staff (%)</td>
<td>11 (11)</td>
<td>52 (10)</td>
<td>23 (5)</td>
<td>4 (4)</td>
</tr>
</tbody>
</table>

Table 5.17 Conversations started by agents

Conversations are an important part of learning and consequently need to be established as a process that can occur in a learning environment. The above discussion detailing conversations (acts) within a discussion list (scene) exemplifies the notions of dialogicity, through multiple responses to questions and through branching conversations and the notion of epistemic authenticity through the students’ ability to engage in thought-provoking discussions that are relevant to their learning. This is
because it requires them to construct propositions and considered responses to elicit higher order kinds of learning.

Thus, the purpose of lists for students ranges from the external motivation of passing to the internal motivation of connecting with fellow students. Their use of scenic concepts, such as a place to study, further highlights the appropriateness of utilising Burke’s (1969) Pentad for an analysis such as this. Conversations evident within the list demonstrate the relevance of list interactions for developing intersubjectivity.

5.7 Relations between elements

The above descriptions, while apparently focusing on a single element of the pentad, demonstrate that a description of one element also overlaps and incorporates others, as foreshadowed at the commencement of this Chapter. For instance, the description of the scene also includes a brief description of the agents involved and the acts possible. Likewise, the description of the agents is in part defined by the acts the agents undertake and their purpose for being involved. Acts can be described in terms of the agents present and the purpose of the act. Agency also reflects aspects of both act and scene. Finally, purpose can be elicited from agency and with reference to scene. These tensions, that is, the confluences of and the interconnectedness between elements, provide much in the way of understanding of learning through mediated means. Through this discussion, the nature of the Pentadic elements and their applicability to a virtual environment are demonstrated.

The success of an online learning environment is, in part, dependent on the agents (both students and teachers), whose participation levels are high; they establish a pattern (the messages they send) through their presence. Students who are apparently motivated and teachers who are dedicated provide a foundation, a pattern, for an interactive scene. However, to a certain degree, there is a greater influence of the teacher on the attitude of the students to the list. If the teacher is highly visible (e.g. creates a distinct pattern) and frames the list in such a way as to indicate that visibility (e.g. pattern) will be evident, the students’ perception of that list may be more favourable and their success seems much more likely, according to the data provided above.
Engaging in conversations (i.e. a specific pattern of related interactions) as an initiator, a contributor or as a silent partner is an important part and process of participant learning and, consequently, needs to be promoted as a pedagogic process that can occur in a mediated learning environment. This notion of dialogicity, through conversation, and the epistemic authenticity, through epistemically relevant tasks which may result through the students’ ability to engage in thought-provoking discussions, may be seen as central to the success of email discussion lists. However, any success is partially dependent on the teacher for the formation of these conversations through their framing. Without this part of the pattern, randomness may appear, with students unable to establish any pattern in a seemingly chaotic environment.

Further, students whose participatory style is vicarious may also be more likely to benefit within large groups, where the motivated agents are interacting at a high level. Vicarious interactors (Hatano and Inagaki, 1991, Sutton, 2001) gain much from sitting on the sidelines. This can be seen as a negative in an environment where visibility equals presence. In the face-to-face tutorial, these vicarious interactors can comprise participants seen to be nodding and agreeing with others, but this is not possible within an online environment, where similar levels of engagement are evident. Were they required to indicate their agreement or that a particular interaction had helped them, the scene and the acts may become too frequent and, therefore, unmanageable. Likewise, to mandate their involvement is to place additional burdens on their learning and perhaps prevent them from participating in their preferred manner. This could result in a considerable loss to these students.

These are the key findings in this chapter. A more complete discussion of the interrelations between these elements of an online learning environment is presented in Chapter Six where these findings are related more directly to the theoretical concerns in Chapter Two. Chapter Six also includes a critique of the value of the Pentad for discussing a virtual scene. It is through these interactions that the Pentadic system is best elaborated.
6. A Pentadic analysis

6.1 Nature of pentadic relationships

This chapter synthesises the findings of Chapters Four and Five and integrates them with the conceptual framework from Chapter Two into a unified and cogent conceptual basis for describing and evaluating online learning environments and their pedagogic properties. In doing so, it advances how textually-based environments are enacted and how student participatory practices influence what constitutes the learning environment. It commences this process by further elaborating the interdependence of relationships among Burke’s Pentadic elements and then links this to the theoretical premises outlined in Chapter Two. The first section explores how the tensions and relations among the pentadic elements are manifested and proposes the Burkean Framework as an appropriate means to identify and elaborate these tensions, although it has rarely been used in this way.

As proposed in Chapter Two and rehearsed in Chapter Five, a key strength of the Burkean Framework is not only that it furnishes five elements through which to describe a situation, but that this description extends to illuminating how these elements are in tension. That is, each element can be identified as being to some degree reliant on the other elements in order to fully understand their purposefulness and inherent tensions. Radney (1996) describes these tensions and Burke’s purpose in utilising them as:

Who [agent], What [act], Where and When, [scene] Why [purpose], and How [agency] are not the only important questions to ask, but also how the What and Where and When interrelate (Scene-Act ratio), how the Who and Where and When interrelate (Scene-Agent), and so on. So for Burke it wasn’t enough to know that someone did something at a given time and place using a certain instrument and for a stated purpose, he also wanted to describe the Agent's relationship to the Scene, now as acting and again as acted upon, and similar sorts of things. Of course, as the title of his book [A Grammar of Motives] implies, he wanted to use such descriptions to better understand why people do what they do. (online)

So the elements in dyads, for instance, the scene-agent ratio, provide greater insights into what motivates people to undertake an activity, because it is through the elaboration of the tensions between the act and the scene, for instance, that the meaning of the act is further illuminated through an elaboration of other elements. As proposed in the
Pentadic relationships

previous chapter, each element, even when discussed individually, that is, through attention to each term as a single element, still requires other elements to assist in its definition. In this way, the understanding of educational motivations is illuminated, because the purpose for engagement, for instance, is highlighted by how individuals engage with the scene (agency). The surprising aspect is that this scheme (Burke’s Pentad) has not been utilised extensively for understanding learning environments.

A review of Burke’s Pentad’s use in education shows that Burke’s framework appears most consistently in terms of the teaching of communication (known as Rhetoric in the USA). In this area, the framework becomes a tool for teaching and learning to analyse an event or narrative. Only occasionally has it been used to analyse teaching and learning (e.g. Freeman, 1974). In some ways, it appears that a ‘terministic screen’ (Burke, 1966) has been applied to the use of the Pentadic elements. According to Fox (2002), a terministic screen directs our attention toward a particular representation of reality and away from others:

even if any given terminology is a reflection of reality, by it's very nature as a terminology it must be a selection of reality; and to this extent it must function also as a deflection of reality. (Burke, 1966).

The ‘selection’ of reality to which Burke’s concepts have been applied has, to a large degree, deflected their application away from self-critical processes which could be more widely applied to learning contexts. Analogously, Kaplan (1995) states that terministic screens are broader, encompassing both social and technological formations:

… all social-technological formations like print or computers provide what Kenneth Burke has called "terministic screens" and what others call an ideology: a definition of what exists; an account of what things are good, beautiful, and worthy of our attention; and a set of implications about what scope of human action is possible. (Kaplan, 1995, online)

So, in effect, the use of Burke’s (1969) Pentad in analysing communication is good, beautiful and worthy of our attention, but has been seen as less so when applied to educational settings. The use of the Pentad as a device for understanding communication may preclude its use in other ways, because of the historical conventions being applied and the apparent use for analysing the product of that communication.

Burke (1941) highlights the possibility of this conventional approach to an argument in his parlour metaphor:
Imagine that you enter a parlor. You come late. When you arrive, others have long preceded you, and they are engaged in a heated discussion, a discussion too heated for them to pause and tell you exactly what it is about. In fact, the discussion had already begun long before any of them got there, so that no one present is qualified to retrace for you all the steps that had gone before. You listen for a while, until you decide that you have caught the tenor of the argument; then you put in your oar. Someone answers: you answer him [sic]; another comes to your defense; another aligns himself [sic] against you, to either the embarrassment or gratification of your opponent, depending upon the quality of your ally's assistance. However, the discussion is interminable. The hour grows late, you must depart. And you do depart, with the discussion still vigorously in progress. (p. 110-111)

Having entered the discussion late, so to speak, the grounding of the Pentad appears solidly located within communication studies. However, in considering all features of communication, it becomes apparent that Burke’s Pentad is useful for studying the process as well as the product of communication, such as the change in individuals or learning that arises through interpersonal interaction, such as in the Vygotskian tradition. The apparent lack of a strong focus on studying the process of communication, particularly learning through communicative processes, is perhaps indicative of the ‘terministic screen’ mentioned above.

In exercising the concept of terministic screen more widely, classroom learning, online learning and the screenface can all be seen as terministic screens through which to view the activities associated with what is called learning: individuals’ constructing and building further their knowledge and ways of knowing. Constructivism, objectivism, collaborative learning, indeed nearly all forms of learning theory, likewise, can be seen as terministic screens through which researchers build perception and representation of what it means to learn, of what we believe to be the best way to go about working with knowledge and students. Now that learning is being seen as an everyday act in which individuals engage, such as in the constructivist project, rather than being wholly linked to the act of teaching, and the role of the social in that learning is being emphasised, the gap between communication and learning processes has closed. Constructivism, perhaps, assists rendering learning as an ongoing inter-psychological process, thereby making modes of analysis such as offered by Burke more salient.

In terms of achieving these goals, the screenface privileges and brings to the forefront the interaction between learner and their world of learning, the agent and the scene. Yet it also elaborates and brings into focus the mediational means (agency)
Pentadic relationships through which learning arises, as highlighted by Wertsch (1998). Here, mediational means is taken as the agent-acting-with-cultural-tools, which merges agent and agency. Classroom learning tends to privilege the scene, the agents within the scene (i.e. students and teachers) and the interaction of their agencies. However, the agency of the student may be subordinate to or in contestation with the agency of the teacher, giving rise to a form of tension in the scene – one between agents. The screenface, in online learning environments, on the other hand, privileges the student and where they are, that is, the agent and the scene. For instance, the agent (i.e. student) acts with mediational means (i.e. the computer) at the computer (i.e. the scene or at least one aspect of it) with the degree of independence and interdependence that may be distinct from the differently constrained environment of the classroom.

Other examples of the use of the Pentad include Lindquist and Persson’s (1993) analysis of service management. They argued that managing service quality often reduces to analyses of what form a tool should have. These kinds of analysis are relevant to online learning because much discussion has focused upon what form the learning environment should take, thus reducing learning to discussions of agency and, thereby, neglecting who the agent is and where they are. This distinction is important, because it is the individual who is learning and who brings extensive and diverse experiences to the learning environment, which they will construe in particular ways. These experiences may be differently utilised within the learning environment, and indeed constructs and constitutes the learning environment.

However, as Lindquist and Persson (1993 p28) point out, the starting point of ‘customer service’ for studying service quality “means that the conceptual framework one develops will direct the attention away from the ‘very nature’ of services – being actions”. This means that the framework that is appropriated by the provider of a service, for instance a learning environment, neglects the very real, diverse experiences that teachers and students bring to a learning environment instead forcing individuals to engage in the same manner, regardless of their experiences and understandings. Thus, the focus on the quality of the specification of the online learning, or other aspects of the provision of learning in online environments, moves the focus away from the act of learning and its purpose and towards a simplistic ‘one size fits all’ implementation (Kuriloff, 2001). Instead, however, as exemplified in the data provided in previous
chapters, it is necessary to understand that there is a person dependent dimension to what constitutes learning environments.

So in appraising environments as diverse as service industries, classrooms and the use of online learning environments, the potency of the Pentadic elements is in its capacity to illuminate both the contributions of the separate elements, so that each element’s contribution to the environment can be elucidated in terms of the pentad, and to illuminate the relations amongst elements so that the reciprocity or interdependence among the definitional aspects of the terms can be understood. This means that our definition of an environment implies both a place and its use (i.e. an act). For instance, as Burke notes:

To tell what a thing is, you place it in terms of something else. This idea of locating, or placing, is implicit in our very word for definition itself: to define, or determine a thing, is to mark its boundaries, hence to use terms that possess, implicitly at least, contextual reference. (Burke, 1969 p24)

Therefore, in order to establish a basis for understanding online learning, the environment, including where it is (scene), what is done (act), who does things (agent), how (agency) and why (purpose), needs to be explained often in conjunction with more than one element. This was the purpose of Chapter 5. The next section proposes that the Burkean Pentadic Framework provides contextually specific references for understanding learning environments.

6.2 Burkean contributions to learning research

Burke's (1969) Pentadic Framework provides a means by which the personal and situational contributions to a learning environment can be understood in terms of the scene that constitutes the setting, the purposes and means that those acting in it are able to deploy, all of which collectively constitute the learning environment. The analysis in the preceding Chapter showed how each element could be described. However, as discussed above, a salient quality of Burke's scheme is that it can elaborate and illuminate the relations among the elements. Figure 6.1 depicts many of these relationships principally in terms of dyads - between the elements. In this Figure, each of the elements is represented. The interconnections between the elements depict the dyadic relationships that arose from the analysis in Chapter Five. Representation of triads are difficult to depict. However, it is possible to identify how certain concepts, which are normally used to discuss learning, such as participating and interacting, are
depicted multiple times within the pentadic elements, in effect picking up the relationships among three or more elements. Each of these concepts requires viewing from multiple perspectives to understand their contribution to a learning environment. The interplay of the dyads illuminates how each element contributes to the definition of learning and associated activities.

Figure 6.1 Burke’s pentadic elements with concepts of learning superimposed.

In this Figure, participating is seen to be located in at least four dyadic relations, specifically: (i) scene-act; (ii) scene-agent; (iii) scene-agency and (iv) scene-purpose. Participating is an act in a scene, one that agents in the scene undertake, through the agency of accessing the scene, and is the purpose for accessing the scene. Consequently, agents constitute the scene through the acts they undertake with the computer to participate. In other words, the agents assist in defining the scene through their presence. The agent(s) constitutes the scene through the number of students
populating the scene, their gender and their mode of study. The scene, on the other hand, assists in defining the agent through the roles the agents may take and their modes of engagement, as participants or browsers (i.e. the agency employed to access the scene). Their purpose, such as asking a question as a ‘full’ participant or browsing the collected messages, indicates their purpose. Thus participation is defined by the agents accessing the scene, by the act being undertaken in the scene, by the agency through which the scene is accessed and finally the purpose for which the scene is accessed. The elements interact in multiple ways to describe what participating means. The implication of this is that discussions of learning utilising these dyadic relations are clearer and focused on the elaboration of learning processes.

Interaction, likewise, is located on at least four dyads, specifically: (i) act-agent; (ii) act-agency; (iii) act-purpose and (iv) agency-purpose. Thus, these relations suggest that interacting is an act done by an agent, with agency, for a purpose. In this way, the act of interacting is constituted by the agent (i.e. students), in the modes of their participation as browser or more visible and active participant, through their agency via the computer or screenface, and through their purposes for learning, gaining assistance or simply to pass the course. This highlights one of the distinctions between interacting and participating. Interacting is more reliant on the definition of agency, while participation reflects a scenic constraint. Participation occurs in a location; interaction occurs between agents. This distinction may have important consequences for assessment as students assessed on ‘participation’, particularly in face-to-face situations, often view attendance as equivalent to participation. Thus, they participate (vicariously) without necessarily actively interacting in a way that others would recognise as interaction.

Learning in this way can also be understood and located on multiple dyads, specifically: (i) act-scene; (ii) scene-purpose; (iii) agent-purpose and (iv) act-agent. This can be described as how an agent (i.e. student) undertakes acts in a scene for specific purposes. So for instance, a student subscribes to a discussion list in order to participate in interactions to support their learning. In some ways, the agent cannot act in specific ways unless a part of the scene. For example, a student cannot undertake the learning activities without being subscribed and, at least, reading a message. The agent is only part of the scene because of their purpose for acting. This suggests the importance of the learners’ intentionalities in engaging in a learning environment. As
noted, this intentionality can have diverse bases and consequences for engagement and learning. Consider, for instance, those who merely subscribe, compared with those who engage actively, monitor responses, and/or generate questions and responses to other's questions. Their intentionality differs yet their purposes for being subscribed, that is, to facilitate their learning, are similar.

The screenface, as discussed in Chapter One, is the specific location of work for individuals. It incorporates the desktop, the screen and the layers in between – the interfaces to the educational programs and resources as well as to the other students with whom an individual interacts. The screenface represents the tensions between all pentadic elements. This is because the screenface is the scene of the agent’s (i.e. student’s) acts; it is the focus of their agency through which the agent acts, and permits the purpose for which the individual acts to be accomplished. The screenface is, in sum, the agency, which affords the fulfilment of the purpose for which the agent acts in the scene.

Subscribing, on the other hand, is located on two dyads, as subscribing is an act that places the agent in the scene, albeit a minor act in the overall learning process. However, this initial act is essential to allow other acts to follow, for the potential of the learning environment to be realised. Its importance is, in some ways, negated by its simplicity and its location on a single dyad. However, the outcome of subscribing is for the agent to gain access to the scene.

The interaction between the agent and the scene allows ways of making distinctions between learning environments such as workplaces and classrooms. Both act and scene inhere in these situations. Learning is constituted by the place it is undertaken and indeed, many different theoretical frameworks have been developed which take into account the different locations of learning (e.g. Lave and Wenger’s (1991) Situated Learning; Billett’s Co-Participation at Work (2002); and Wertsch and Toma’s (1995) Sociocultural approach to classroom learning). Each of these frameworks takes scene into account, using scene as a defining characteristic of learning situations. Thus scene, an important aspect of learning, is sublimated to other influences but is sometimes inadvertently used to define learning. Burke’s Pentad allows this aspect to be brought to prominence and allows distinctions between learning frames and processes of learning to be made.
Radwan (1995) discusses Burke’s ‘frames of acceptance’ from *Attitudes to History*. He quotes Burke as defining them as “the more or less organized system of meaning by which a thinking [hu]man gauges the historical situation and adopts a role with relation to it” (Burke, 1961, p5, in Radwan, 1995 online). Frames of acceptance, in effect, “ultimately involve courses of action, telling us in effect ‘do do this’ ” (Radwan, 1995). This relates to the above scenic discussion through the framing outlined in Chapter Five, which indicates the scenic parameters, specifically ‘these are the acts that can be done in this particular scene’. Thus act and scene are mutually defining but require specific attention, allowing learning frameworks to be contextualised, that is, related directly to the location. In this way, Burke's Pentad provides a conceptual framework that is not constrained by the orthodoxies of considering classrooms or workplaces as learning environments. Instead, by identifying the underlying premises of the interdependence between setting and individuals’ engagement with settings, it offers a basis not constrained by conceptual orthodoxies.

Another key contribution that the Burkean scheme provides is an elaboration of how learning arises through the intersection between human intentionality and the settings in which humans engage. Wertsch states that Burke “envisioned the pentad as a tool for conducting enquiry about human action and motives” (Wertsch, 1998, p14). As such, it allows a more inclusive analysis of a human activity environment, which includes people and artefacts. Yet, the relationships between humans and artefacts are complex and have been studied, in relation to learning, from numerous perspectives. Among these are activity systems (Holman et al., 1997) and anthropology (Lave and Wenger, 1991). These all propose that there are important intersections between the settings where people engage in activities and the learning that arises from that engagement.

### 6.3 Comparison of conceptual frameworks

The theoretical frameworks that have been used to research learning were introduced in Chapter Two. The most useful of these for the current research include activity systems (Hung and Wong, 2000, Jonassen and Rohrer-Murphy, 1999, Kuutti, 1996, Lewis, 1997, Scribner 1997) and Lave and Wegner’s (1991) legitimate peripheral participation. These frameworks both provide insights into learning from beyond the classroom environment, which has specific contexts for use. The frameworks required for
understanding an online learning environment require attention to both the individual level and the social level of human interaction outside a geographically constrained environment such as the classroom. Accordingly, this next section focuses on a comparison of theoretical frameworks that have been used to further learning research.

The theory of activity systems is a philosophical framework for illuminating how both individual and social levels of human practice are simultaneously interlinked (Kuutti, 1996, Lewis, 1997). This linkage allows for the bridging of the dichotomy between the individual and the social, which stands to exclude either human agency in the social or contextuality in the individual (Lewis, 1997, Hung and Wong, 2000). Activity theory challenges the Cartesian Mind/Body dualism by emphasising dualities in relations between the mind and body (Scribner 1997) and is located within constructivist notions of epistemology (Jonassen and Rohrer-Murphy, 1999) and in the work of Vygotsky. The key premise of activity theory is that there exists a “fundamental type of context, called an activity” (Kuutti, 1991, p531). An activity is where an individual’s actions are mediated by tools to achieve an objective (Lewis, 1997). This is elaborated in the following narrative form:

“an individual (subject) is helped by tools to achieve an objective (object) and may accept rules to work in a community which contributes to the objective through a division of labour. From such an activity there is an outcome.” Lewis (1997, p213 italics in original.)

So for instance, in the learning environments, activity theory views an individual’s actions to achieve an objective through the mediation of the action by artefacts and then extends that to a community context. Knowledge ‘owned’ by one individual may overlap with another individual’s zone of proximal development (Lewis, 1997). So each individual may be able to assist others in their learning within a social group. While similar to Burkean Theory in many respects in that it includes an subject (agent), an object (act) and tools (part of the scene), it tends to focus on the process arising from activity rather than the motives leading to activity, including individual agency. While this focus assists understanding how the situation will contribute to learning, it may be less helpful in understanding how individuals elect to engage with what constitutes the setting. Note also the different levels and kinds of participation in the activities provided through the four courses, as discussed in Chapter Five, which reinforce the significance of human agency in the constructive act of engagement and learning, and the inevitable personal-dependent dimension of learning environments.
In many ways, activity theory is premised on the idea that all learning is contextualised within a particular kind of setting or community (Lewis, 1997). One of the problematics of activity theory is that it posits that performance outside of the setting is not conducive to learning (Jonassen and Rohrer-Murphy, 1999). This means, all activity must be viewed through a contextualising lens of a community. However, distance learning is inherently outside the physical educational institutional setting in that it is generally undertaken by an individual isolated from both the university and any community of practice. The learner is removed from peers and teachers and often from many of the contextualising features of the environment. The nature of an online environment is to re-establish some of the contexts through which peers and teachers can interact, albeit in a somewhat decontextualised setting of the online learning environment. So while activity theory focuses on the processes within an activity, the Burkean Pentad, on the other hand, accommodates and privileges intentionalities and motives leading to individual activity. The Pentad elaborates to what degree an activity is contextualised and whether there exists a community of individuals operating within a specific environment. Note the differences evident in MathComp with respect to the emergence of a community of learners due to this course list’s emphasis as a ‘self-help’ group rather than one which provides a ‘forum’ for discussion. Through interactions, as demonstrated in Chapter Five, a more contextualised and embodied outcome is possible via electronic communication.

‘Situated learning’ (Lave and Wenger, 1991) also posits that learning must be participative and, hence, partially contextualised within a community of practice. Lave and Wenger’s (1991) main thesis is that learners work within communities of practice and that ‘legitimate peripheral participation’ helps to describe the relations between new-comers (i.e. novices) and old-timers (i.e. experts) so that “learning is an integral and inseparable aspect of social practice” (p31). It is through their participation in the community of practice, according to Lave and Wenger (1991) that individuals’ identities are developed in association with the community. These processes and outcomes are directly associated with learning. The emphasis is on the ‘whole person’ acting in the social world. Their perspective implies:

emphasis on comprehensive understanding involving the whole person rather than ‘receiving’ a body of factual knowledge about the world; on activity in and with the world; and on the view that agent, activity, and the world mutually constitute each other. (p. 33)
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That is, through their participation they come to know and understand. However, that participation and knowing is a product of the exercise of both individual’s agency and that afforded by the community. It is a ‘theory of social practice in which learning is viewed as an aspect of all activity’ (p. 37-8). So, their contribution and alignment with Burke’s pentad is to emphasise the interdependence between learning and participation in a socially-derived practice.

It is important to link Lave and Wenger’s (1991) notion of transparency of artefacts with Burke’s scheme as it aids in the discussion of “cultural practice and social organization within which the technology is meant to function” (p. 102):

Invisibility of mediating technologies is necessary for allowing focus on, thus supporting visibility of, the subject matter. Conversely, visibility of the significance of the technology is necessary for allowing its unproblematic – invisible – use. This interplay of conflict and synergy is central to all aspects of learning in practice: It makes the design of supportive artifacts a matter of providing a good balance between these two interacting requirements. (Lave and Wenger, 1991, p102)

‘Transparency’ refers to the interaction of the use of an artefact for learning and understanding the significance of the technology with the learning tasks. This suggests that employing a mediating technology, such as computer-mediated communication, is useful mainly for learning communication mediated by a computer, because it is only in learning to communicate that the use of the artefact, the computer, and its significance to the communicative act become merged. However, for learning other tasks, such as solving mathematical formulae, computer-mediated communication may be incidental to learning – facilitative rather than indispensable – and, hence, may disrupt the transparency of artefacts (the computer) that allows for unproblematic use of computer-mediated communication in learning. That is, the computer does not directly influence learning to solve mathematical formulae. For individuals whose learning is about computers (e.g. the IT students in this study), there is less conflict as the technology is part of what they are learning and mediated communication is becoming very much a part of the social practice of the IT industry. Other disciplines are less connected to technology, so unless discussion as a means of learning is extremely important and visible in their learning, the use of the technology for discussion could be construed as ‘busy-work’ – irrelevant and non-productive activity which benefits the teacher knowing the student is understanding. There is a longer history of the use of information/communication technologies (particularly bulletin boards) in IT and related
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fields, giving it a cultural validity that it may lack in other fields. The point here is that, the artefact, the computer, and its mediation of learning are both necessarily visible for communication but that visibility may impinge upon the kinds of learning being undertaken and which may not be reliant on either the artefact or its effect on learning. Consequently, a consideration of the importance of the artefact and its relationship to learning particular sets of knowledge is important.

This discussion of Lave and Wenger’s (1991) notion of transparency highlights how important Burke’s (1969) notion of scene is to understanding how learners engage with knowledge construction at the screenface. For many people, and particularly the kinds of students who participated in the second and third phases of the investigation, the screenface is transparent. The working document appears at the screenface and the workings of the interface to the program become secondary to the processes being engaged in. Thus, their place of engaging is at the screenface. The screenface becomes important in depicting an individual scene. Using email as an example, the interface to the messages does not remain constant, as each student may be using a different program to access their messages. For instance, many universities and Internet Service Providers provide a web-based interface that also allow downloading email to a ‘client’ program such as Outlook, Eudora, and Lotus Notes. Thus, the scenic interface to the messages is multiple and varied, but no more so than the multitude of constructions that individuals will bring to these variations in screen face. So because of the multiple constructions, there is no simple way to establish the totality of what the scene is for a student in an online environment, because it is situation and person dependent. This is perhaps one of the reasons for establishing a ‘standard’ interface for learning/course management systems, such that the scene becomes predictable. All students interact with the same interface to the learning management system. What this does, however, is negate the individual’s way of working and places another layer, which may need to be mastered and appropriated by the student, between the student and their learning.

It follows then that students’ status as novices or experts with the technology may directly impinge upon their ability to interact with the screenface. In appropriating the technology, novices may experience differing levels of tension with the technology. For instance, a novice may be unaware of protocols, the shortcuts to commands and, indeed, the commands themselves (such as how to search a set of messages) that have been established during previous implementations of technologies. This can result in
problems with an individual’s way of working and, as a result, disrupt the group dynamics that may be working within the online environment. This type of disruption was seen in the discussion lists as the asking of questions that had already been asked. Consequently, students need to be more than competent with the technology; they must understand the conventions concerning its use and through which they and others will interact. This understanding may evolve through their relationship to the computer, to the level of mastery or appropriation of the interface (i.e. the screenface), but primarily with the groups with which they interact.

This understanding may be assisted by the framing of the course by the teacher, which details how interactions may be undertaken. Framing – the process of establishing a field of activity related to the intended learning outcomes - represents a system of practices, instituted by the teacher, that can be seen as the rules through which the community of participants needs to engage. As was proposed in the discussion lists in Chapter Five, the framing appears to have considerable impact on how these students approach the task of interacting with their peers and teachers. Where the framing allows for the possibility of assistance from an expert, novice learners are more enabled to utilise the technology in their learning. For example, this study suggests students approach the discussion list with preconceived ideas of what they will gain from involvement, in effect, a form of terministic screen. This relates directly to the scenic parameters established before implementing the interaction medium. In this way, course coordinators and/or course designers, in framing the potential of the discussion list, can potentially impact the learning potential of a student before that or any other student even contemplates enrolling in the course. This was particularly evident in the framing of MathComp as ‘self help’, which appears to have had the effect of reducing the establishment of a community of learning, because it was reported as reducing the need to interact with others to secure information required to complete the course successfully.

Consequently and contrary to what is suggested in some literature, an online learning environment, which is posited as a *community of learners* in both activity theory and situated learning, may not actually facilitate the establishment of a community, in part due to the framing imposed by designers. This aspect may need to be considered more fully by designers prior to the environment being introduced to students, because the purpose of the provision of the environment is central to ensuring
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learner engagement. Burke’s (1969) Pentad allows the analysis of the interaction between the purpose of provision and the environment, in the form of the purpose-scene dyad, to be illuminated and understood. For instance, the purpose of provision for the four lists ranged from self-help to a forum for support from peers and teachers, and the consequences of that framing for the learning environment ranged from poorly supported to rich and busy, respectively. Furthermore, the Pentad, in the scene-act dyad, allows attention to be given to contextualising features of learning. Rather than denouncing a learning situation as de-contextualised, the Pentad allows these contextualising features to be illuminated and elaborated as was demonstrated in Chapter Five.

There are many different conceptual frameworks for understanding a learning environment. Burke’s (1969) Pentad allows an analysis that parallels many aspects of the two which have been discussed here, for instance. Many of the features which the Pentad focuses on illuminate the processes which lead to other conceptual frameworks, but which provide a different lens through which to view them. Burke’s (1969) Pentad may allow investigation into new forms of learning environments, which can then be utilised within other conceptual frameworks. While the above discussion focused on two conceptual frameworks for understanding learning, the next section investigates the concerns that have been raised within the theoretical discussion of Chapter Two.

6.4 Learning processes

This section revisits the learning concerns that were raised in Chapter Two. It follows from the analyses in Chapters Four and Five and furthers the understanding of learning in online environments through conceptual analyses. The analysis of interactions, which commences this section, is generally the defining aspect of discussions on learning, that is, what students are doing. However, as noted above, these acts are only possible within a particular scene, or at least, take on specific qualities as a result of being located in a specific scene. While agency is also of specific interest through the use of mediating technologies, the use of such technologies is dependent upon the scene, that is, where the agents are located. For instance, in most cases, it is likely that the use of computer-mediated communication takes place between physically-separated agents. This is not to imply that computer-mediated communication cannot be used where agents are co-located, but that this form of use is less frequent and generally
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involves the inclusion of physically-separated agents together with those who are co-located. The context of this research incorporates both isolated and co-located students and both these groups with their differing locations impact in different ways upon the processes involved in creating the learning environment.

Table 6.1 outlines the major issues emerging from section 2.2, which are then related to Burke’s (1969) Pentadic elements. Each issue is addressed by interpretation of its potential to relate to the elements. For instance, interactions can be defined by who is undertaking the interaction, what it entails and where and when it occurs.

<table>
<thead>
<tr>
<th>Concern about learning</th>
<th>Element of pentad:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scene, Act, Purpose, Agency, Agent</td>
</tr>
</tbody>
</table>

**Learning Processes (Section 2.2.1)**
- Interactions: What is being done (act) by whom (agent) where (scene)
- Zone of Proximal Development: What learning (act) is possible by whom (agent)
- Structured multiple processes: What processes (acts) are being undertaken by whom (agent) for what purpose

**Learning and Mediation (Section 2.2.2)**
- Mediated speech: Who (agent) is speaking (act) where (scene) and how (agency)
- Forms of mediation: How (agency) is interaction (act) occurring between whom (agent)
- Dialogic mediation: Who (agent) is interacting (act) how (agency)
- Epistemic authenticity: How (agency) and why (purpose) interactions (acts) are being undertaken
- Mediated genres: What speech (act) is allowable/doable (scene) and why (purpose)

**Mediating Mediation (Section 2.2.3)**
- Immediacy: Where/when (scene) interactions (acts) are taking place by whom (agent)
- Intersubjectivity: Who (agent) is interacting (act) how (agency) where (scene) and why (purpose)

Table 6.1 Relationship between environmental contributions to individual learning (section 2.2) and Burke’s Pentad (section 2.3)

From the perspectives advanced above, any analysis of a learning environment becomes a question of ‘what are individuals doing?’ when they are engaged in the activities that constitute learning? To pose this question is to imply ‘where they do it’, ‘why they do it’, ‘how they do it’ and ‘who they are’ as elaborated above. In terms of Burke’s (1969) pentadic elements, the act (what they are doing) is central to an understanding of learning environments and learning. However, a sociocultural
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perspective, particularly using Burke’s (1969) Pentad, requires attention to all elements rather than a single element. In essence, the influences and interactions between elements are important.

Thus, each of the concerns that were raised in Chapter Two are addressed through reference to the findings predominantly from Chapter Five. This discussion focuses more firmly on these concerns but utilises outcomes of the Pentadic analysis to elaborate on them. Thus, those concerns that were theorised as being important in Chapter Two are re-presented in terms of the findings of this study.

6.4.1 Interactions

In Chapter Two, the social aspects of learning were discussed with reference to Lave and Wenger (1991) and Newman, Griffin and Cole (1989). The salience of their arguments was that knowledge has its genesis in the social world beyond the individual. The social world can assist with scaffolding and can support learning. The example given there was that posing questions to an expert can provide the basis for novel approaches to learning. Therefore, the understandings that Lave and Wegner (1991) and Newman et al (1989) can provide may be useful in discussing learning in a mediated environment in which interaction between individuals is central.

In Chapter Four, it was proposed that the interactions through an email discussion list can provide effective pedagogic tools for assisting students’ learning. It was also advanced that, in the courses examined here, external students are apparently taking up this innovative method for learning at a greater rate than their on-campus colleagues. However, there was also evidence that factors beyond the individual are shaping the form and frequency of online learning interactions. In Chapter Five, it was claimed and demonstrated that the influences on the form and function of online learning interactions included: (i) the proportion of females within the course; (ii) the mode of enrolment (e.g. on-campus versus externally enrolled), and (iii) the framing (the pedagogic expectations of the course co-ordinator). This latter aspect, the framing, is beyond the individual yet engages with the agency of the individual. Each individual must negotiate an understanding and ‘way of working’ within that framing, as previously discussed. However, the types of interactions favoured by these students tend to be directed towards achieving course-specific objectives. That is, their basis for engaging
with the discussion list was directed towards achieving the specific course of objectives, principally successful completion of assessment tasks.

Thus, the intentionality, or in Burke’s (1969) terms, the purpose, of the interactions is a key feature for understanding online learning environments. This was highlighted by the long response from Respondent #116, whose intent was undermined by responses from the lecturer. This occurred within the course that was framed as ‘self-help’:

The few responses that I have had from lecturers have been useless. Not very helpful at all and sometimes demeaning. Not at all confidence building. No constructive tuition. This is difficult when my main source of interaction with fellow students and lecturer is via email. Considering that all we are trying to do is understand and pass a subject. I understand that lecturers are busy people but sometimes the short and criptic [sic] responses are a waste of time and energy. [Resp. #116, MathComp, ComProgA]

Therefore, when the purpose for engagement on the part of the student does not match the purpose for provision by the course co-ordinator, the agency of the student can be undermined. This may result in a reduced facility for learning and a consequently less successful deployment of the technology and engagement with the online learning environment. This is not to say that it could not have other consequences as well. For instance, the student might be motivated to succeed in spite of the lecturer. However, this study suggests that students are less likely to engage (act) where the purpose for that engagement is not directed toward the achievement of course-related objectives.

Conversely, there was evidence that intersubjectivity or shared understanding could emerge to a limited extent in the long interactions within some lists. These kinds of interactions were not directly addressed by students in the survey, although ‘discussions’ which indicate long conversations evident in some lists were seen as very valuable. For instance, Respondent #93 noted that interacting with others, particularly through answering others’ questions, is important to their learning:

One is able to read questions posed by other students and the answers given, sometimes by lecturers. Answering other's questions helps your knowledge to "gel" in your own mind. If you can explain something to someone then you understand it. As an external student if you are not in a study group you do not get that opportunity […] Another valuable aspect is that the discussions, questions and answers are archived and are Seeasily [sic] located for reference throughout the semester. [Resp. #93, ComProgC]
Respondent #93’s reference to the email discussion list standing for a study group reflects the essential nature of discussion for learning.

Interactions (acts) between peers and teaching staff (agents and co-agents), then, become a central focus for learning. The development of discussion highlights that students require assistance towards learning goals and that this assistance, which often occurs within their current level of learning, can guide them to a further or higher level of development. In this way, Vygotsky’s (1978) Zone of Proximal Development can be a useful concept for understanding the degree by which learning through discussion constitutes guidance that will assist the students move to a higher level of development.

6.4.2 Zone of Proximal Development

As was noted earlier, the knowledge that needs to be learnt largely resides outside the individual. Although we learn much through discovery and reflection on our existing knowledge, one great human characteristic is the ability to share knowledge. This saves individuals having to learn what has been developed over hundreds, possibly thousands of years – to engage in Robinson Crusoe-like epistemological adventures. Consequently, an important point of reference is the degree by which a learning environment (scene) permits useful access to the sharing of knowledge that individuals need to access and construct (learn) in order to conduct purposeful activity. Given that some forms of knowledge are less likely to be discovered that others, it is these that most likely require sharing through the close guidance of a more informed partner. Vygotsky’s (1978) concept of the Zone of Proximal Development is therefore important for analysing learning, particularly in peer learning scenarios, which include email discussion lists of the kind that was used in the four courses. Within the discussion lists, a more experienced individual (agent) may provide assistance to a novice (co-agent). The more experienced individual, in this case, can be either a peer within the list or a teacher, and in some cases both, each expanding and elaborating on previous points. The three levels of interactions identified and relevant to an email discussion list were: (i) less experienced-more experienced individuals (e.g. student-teacher); (ii) individual-artefact (e.g. student-material); and (iii) peer interaction (e.g. student-student) (Boettcher and Cartwright, 1997, Moore, 1988). Each of these was evident in the data presented in Chapter Five which provided many examples of peer learning, where individuals assisted their peers, as well as many student-teacher interactions. The third kind, individual-artefact (agent-agency), was particularly evident amongst the browsing
students, whose relationship to the discussion list (scene) was more vicarious, that is, their learning was experienced through viewing the interactions of others.

Many students were aware of this vicarious style of interacting, which was demonstrated by respondent #71:

I've never once posted an e-mail in the list. Not because I did not want to but the need never arose. Most of my questions were usually asked already and answered. [Resp. #71, SQA]

This indicates the student is working within their individual Zone of Proximal Development, because the process engaged in is facilitative of learning and focused on specific problems with which they are confronted. This is despite them not overtly contributing and asking questions concerning their current problem. This kind of engagement is analogous to legitimate peripheral participation where individuals learn by “multiple, varied, more- or less-engaged and -inclusive ways of being located in the fields of participation defined by a community” (Lave and Wenger, 1991, p35). Thus, browsers can be seen as the kind of legitimate participants within the community of learners. However, their peripheral location may be questioned. Whereas Lave and Wegner (1991) proposed that peripheral participants would necessarily move towards fuller participation because of their role as apprentice tailors in tailoring workshops, there can be no such close monitoring of students engaging as peripheral participants in an email discussion list. Consequently, browsers are legitimate participants but their peripheral participation is of a very different nature than proposed by Lave and Wenger (1991). That is, the more embodied setting of classrooms and workplaces (scenes) may exercise very different levels of control over participation than is permissible through distance learning and through the kind of electronically mediated learning that was reported and discussed in Chapter Five. In the same way, the perception of a student as a ‘silent partner’, given by respondent #89, similarly legitimises the learning process of vicarious learners.

As stated in Chapter Five, the purpose of becoming involved, for many students, is focused and precise and related to the immediacy of problems in their zone of nearest development (Vygotsky 1978), developing the knowledge to successfully negotiate assessment items. Many students became aware of questions on the lists, which had arisen during their own learning and that they had not thought to ask. There were keen
to see the answers and other responses. Respondent #11 particularly addressed this facility of gaining answers to questions that had arisen for them:

There were questions posted to the list that I did not know the answer to and was keen to find out what the answer was and I felt that it was useful in that respect. When a question was asked that I really wanted to know I watched the list closely for an answer. [Resp. #11, ComProgA]

Without the interactions within the list that comprised zone of proximal development of some students, other students would be without possible solutions to problems. The key feature here is that students are able to work at their own level and pace of development, posting questions when needed. Yet being aware that other students may have encountered similar problems previously and have provided accessible pathways to resolving those problems provides a helpful form of scaffolding. Thus students’ questions within the Zone of Proximal Development may be addressed, without being asked by each individual.

In sum, there were multiple ways for the students to be engaged with the learning environment. Each of these is no less valid than any other way, but allows students to work within their own ‘zone of learning capability’. The zone of learning capability can be defined as the zone where individuals are able to take those actions necessary to facilitate their own learning. Thus the zone of learning capability is more descriptive of motivations to learn than ability or development. It proposes a more personally agentic view than how Vygotsky’s (1978) Zone of Proximal Development is portrayed. This is further elaborated in Chapter Seven. This zone may be helpful in understanding learners in multiform environments, such as in online learning. It accounts for a student’s ability to engage in serious epistemic roles that maximise their individual way of working. This leads to the understanding that students are working with multiple processes that are variously structured.

6.4.3 Structured multiple process

The perception that learning is a set of structured processes that lead to intended outcomes provides a basis for understanding learning. That there is a ‘best’ way of undertaking those processes is readily contested (Rogoff, 1995). Thus multiple forms of interacting as a process of learning are possible, although some may not be manifested within discussion lists.
In Chapter Two, it was suggested that the plurality of processes which underlie mediation by individuals or artefacts can lead to a set of structured processes which in turn lead to the realisation of intended learning. These processes are defined, in part, by the scene and agency as described in Chapter Five. The online learning environment (scene), in effect, circumscribes the allowable processes, that is, it defines and constrains acts that may be undertaken. This circumscription, in turn, underscores how individuals negotiate that environment (agency). It follows that the environment both constrains and enables the learner’s activity, because it is within the environment that the ‘socially constituted practice’ of engaging with others in dialogue is undertaken. For instance, students were seen to undertake specific acts centred on dialogic interaction, such as posing and answering. Other activities, such as making a comment or discussing a study group, were less likely to be undertaken through the mediation of the discussion list.

Engaging with others in dialogue was shown to take multiple forms (e.g. interaction, as discussed above), but also through a number of more vicarious methods. One set of processes is exhibited by the vicarious learner (Sutton, 2001, Hatano and Inagaki, 1991), who simply browses messages and relates the questions that have been asked to their current problems. However, a second, more structured set of processes involves the storing and searching of discussions. Respondent #60, in particular, demonstrated a novel approach to use of the discussion lists for learning:

I store all the subject emails, when i have a querie [sic] i can first 'search for text within this folder and that usually comes up with some relevant message or two [Resp. #60, not stated].

This method of interacting with the list provided this student with alternate ways of engaging with the knowledge building that had been undertaken by other students. This represents an example of a pedagogic practice initiated and exercised by a student. Given the disembodied nature of online learning, it is perhaps these kinds of student initiated pedagogic practices that needs to be encouraged by teachers. Students referred to the number of previously asked questions that were repeatedly posted after an initial appearance on the discussion list. As proposed in Chapter Five, this kind of interaction, in some ways, can subvert the intended purpose of list provision but emphasises the multiple structured processes students use to interact with an online learning environment; it elaborates the importance of students’ pedagogic practices. It is also
through the attributes that the potency of the multiple forms of mediated learning arise. This will be elaborated in the next section.

6.5 Learning and mediation

Wertsch (1998) postulated that both language and cultural tools mediate learning. This mediation accounts for a number of contributions within an email discussion list and an online learning environment (scene) in general. These contributions include both technological and sociological tools (agencies). This means that both speech and language, as cultural tools, and the computer, Internet and associated technologies influence the ways in which learning is mediated. In Chapter Two, it was noted that a common feature of learning is social mediation, that is, making knowledge accessible through a source of social assistance. This has also been demonstrated above in the discussions about activities and guidance. As noted both there and above, this mediation can be provided by other individuals or artefacts.

Students’ responses to the survey provided insights into individual ways of working with the discussion lists, for instance:

[They are] a very useful tool [Resp. #35, SQA],

An excellent resource that fills in the gaps that are created by not having the luxury of face to face interaction with the lecturer/other students [Resp. #23, ComProgC, SQA]

I feel it is a place I go to if a person is stuck or needs an explanation [sic]. [Resp. #98, ComProgA]

These distinct forms of mediation between the individual and the discussion list exemplify the concept of learning and mediation, particularly where there is a lack of physical contact and students operate from individual environments. Thus students’ speech is mediated by a number of factors including, but not limited to, the screenface, the interaction between the individual in a physical location and the discussion list.

6.5.1 Mediated speech

Learning and interacting (acting) through email discussion lists requires engaging in particular kinds of mediated speech. As discussed above, the kinds of guidance provided by email lists are distinct from those that might occur in face-to-face interactions and workplaces, so too the kinds of speech, which are generated through
email interactions, are distinct from that which would occur in face-to-face encounters. Mediated speech provides a way of negotiating learning, which has been mediated by an artefact (the computer), because it is through speech that understanding evolves. The nature of the interaction/activity as being mediated by tools (i.e. the computer and speech) was brought to centre stage within the context of a Vygotskian-based approach as discussed in Chapter Two. This was useful because, given the ‘non-physical’ nature of interacting online, the focus is shifted toward the processes of mediation, whether by speech or by tool. In the online environment (scene), an individual’s speech (act) is mediated by both speech and tool (i.e. agency of the screenface). For some individuals, this required adjusting the genre and the form of the speech act.

Speech genres have been defined within this research in terms of the individual ‘concrete utterance’, a specific instance of dialogue, within each sphere of language use (Bakhtin, 1986). The genre of a speech act in the online environment was directly related in Chapter Five to the purpose for which students posted messages. For instance, questions were the most common initiator of interactions, which, given the potential for interactions, were second only to responses in frequency. This provided a specific form of speech genres that were generated through interactions and the exchange of information. Thus, there were specific speech genres which were a product of and also essential to the functioning of the discussion list. Likewise, there were other genres less acceptable and which occurred with far less frequency. The most notable of these was the ‘flaming’ that occurred in one of the four lists that were analysed. This genre of mediated speech has particular form and is perhaps more likely to operate within the more indirect form of communication constituting email lists.

Two courses were much more successful in generating the kinds of speech genres which had the potential to lead to the kinds of learning intended for the course outcomes. These genres were questioning and responding to those questions, in effect interacting as initiator or respondent. These lists in these courses also generated more interactions, not specifically question-response, but added to the potential for engagement between individuals. Both lists were framed in positive ways, which has apparently influenced students’ use of appropriate speech genres.

A specific aspect of speech genres was evident in the ways that students addressed each other in individual messages. For instance, some students appeared to be able to negotiate the disjunctive nature of asynchronous interactions through identifying
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Themselves and others in openings and closings to messages. Their salutations provided a means to enter and leave the discussions, in ways made effective by adopting the particular speech genre. One list, in particular, showed more usage of openings and appears to have generated a more collegiate atmosphere within the list. The qualities of this list were as follows: (i) the students subscribed to the list generated more than an average of eight messages per subscriber; (ii) there were approximately 2 responses to every question and, (iii) more than 50% of the messages addressed a specific individual and nearly three quarters closed with both a closing phrase and the individual’s name.

This level of interaction may be unmanageable within a face-to-face classroom environment, particularly if every student asked an average of eight questions over the term and for each question there were two responses. The identification processes contained within the openings and closings likewise would place extra burdens on students operating face-to-face. Using these identification processes, the students are able to direct their questions and responses and not have to identify themselves in the process. Thus, individual speech acts and speech genres can operate to facilitate effective interactions within the discussion lists through forms of mediation that promote collegiality through identification, and more interactions than is perhaps possible in a face-to-face situation.

6.5.2 Forms of mediation

Distinct kinds of learning environments (scenes) are not restricted to a common set of mediations (agencies). For instance, those that occur in classroom environments might be quite distinct from those occurring in workplaces. A number of forms of mediation and interactivity were referred to in Chapter Two, which concerned activity at the human computer interface – the screenface – including: object interactivity; linear interactivity; update interactivity; construct interactivity; and hyperlinked interactivity (Sims, 1995). It was proposed that these forms of interactivity de-emphasise the social, interpersonal aspect of the sociocultural contribution to learning, which is often understood as the combination of direct relations between individuals. However, some of these forms of interactivity can be identified within, and help elaborate the pedagogic potential of, an email discussion list and subsequently, interactive online learning environments. For instance, opening an email and reading the contents may be likened to object interactivity, which was defined as interacting with an object on a webpage as in ‘point and click’. This is, in a sense, the minimal activity required by students who
subscribe. Similarly, linear interactivity, that is following a set path, can be construed from following a set of related messages. In some ways, update interactivity, that is, a feedback loop, is likewise evident for an individual posting a message and awaiting and gaining an answer to a question, because the response to the question is mediated by the computer. Hyperlinked interactivity, that is, navigation through a knowledge base, again, becomes evident in the following of links occasionally provided by participants. Hyperlinked interactivity is also evident in the use of searches through archived messages as explained by Respondent #60:

I store all the subject emails, when i have a querie [sic] i can first 'search for text within this folder and that usually comes up with some relevant message or two [Resp. #60, not stated].

However, construct interactivity, or simulations, may be less obvious in an email discussion list, although there have been efforts to use simulations using email as the mediating technology (see for instance Jasinski and Thiagarajan, 2000). These instances are perhaps closer to ‘real life simulations’ because the responses from other participants are not necessarily predictable and may open up new forms of the simulation which had not been considered by the designer.

Within the four courses, the students tended to utilise a metaphor based on their previous experience, that of the classroom. In Chapter Two, the interaction within an online learning environment is described as “multiple mediational means” (Wertsch, 1998 p100) and took the form of agent acting in the role of learner acting with a computer connected to the Internet providing access to learning material. However, the previous experience of the student appears to add another layer to this form. Thus, it becomes agent acting in the role of learner with previous experiences of learning acting with a computer connected to the Internet providing access to learning material. The mediation between the student and the learning material (whether a webpage of content or an interactional forum) is multi-layered and dense. Further, the negotiation of each of these layers is largely dependent on the individual, so that each individual will mediate these means in possibly very distinct ways. This brings to light the concept of “participatory appropriation” where “individuals change through their involvement in one or another activity” (Rogoff, 1995 p142) and subsequently are prepared for involvement in related activities. Hence, the analysis of the data here suggests that the students’ previous experience plays a central role in negotiating the mediational means presented within an online learning environment.
Thus the form of mediation (agency) within the environment (scene) has many possibilities, both incorporating processes (acts) available in face-to-face situations and going beyond these to provide a much deeper learning experience. However, the negotiation of the multiple forms of the mediation is often based on the previous experiences. As noted in Chapter Five, many students employed a lexicon associated with classroom activities in describing their acts within an online learning environment. Even when innovative use is being made, it was shown that this previous experience becomes important for the student to negotiate the new environment and for the teacher to understand the possible ways in which students approach the learning tasks.

### 6.5.3 Dialogic mediation

As with mediated speech and diverse forms of mediation, the kinds of dialogic mediation that occurred through the interactions in the four courses represents distinctive attributes. This suggests that the form of dialogic mediation that constitutes online interactions has particular properties, which in turn represent particular pedagogic practices. In Chapter Two, interactivity was seen to require some form of dialogicity in order to facilitate the knowledge construction of individuals. This may lead to intersubjectivity between participants but only in limited ways, due to the text-based nature of the interactions. It was noted that our everyday utterances are simple but may change with context, particularly in an electronically mediated environment (scene). In Chapter Five, it was noted that not every dialogue would result in intersubjectivity, although the likelihood of it occurring increases as students interact in enduring ways. This claim was supported by the tracing of conversations that occurred within the lists.

For students, engagement in an ongoing dialogue with their colleagues was seen as a highly beneficial aspect of an email discussion list. For instance, respondent #31 made specific reference to the interactivity generated within a list in the following way:

> [ComProgC] is the best group I have ever participated in. It is highly interactive, and is made much more so by very active participation of the lecturer [name]. I see these lists as a very valuable tool that assists in reducing isolation and contributes to my progress through my degree. [Resp. #31, MathComp, ComProgA]

In Chapter Five, it was noted that these are the processes that may lead to intersubjectivity between participants. Nystrand (1997 p8) proposed that dialogue is
more than a process of turn taking and that it is “continually structured by tension, even conflict, between the conversants, between self and other, as one voice ‘refracts’ another”. This is particularly highlighted by respondent #93 and compared to the face-to-face study group:

One is able to read questions posed by other students and the answers given, sometimes by lecturers. Answering other's questions helps your knowledge to "gel" in your own mind. If you can explain something to someone then you understand it. As an external student if you are not in a study group you do not get that opportunity [...]. [Resp. #93, ComProgC]

For the externally enrolled students engaging from a distance from the university, there are particular opportunities presented by participation in the kinds of online discussion identified in the investigation. These students are able to engage with their peers and enhance their learning through both short and long conversations, which provide different contributions to their learning.

Conversations (i.e. acts with purpose) are presented in Chapter Five as an important part of learning, which consequently need to be established as a process that can occur in a learning environment (scene). For the student (agent), this can be thought of as “epistemic motivation, the desire to know and understand” (Hatano and Inagaki, 1991). The concept of conversations in cyberspace exemplifies the notion of dialogicity through multiple responses to questions and through branching conversations.

Thus, the investigation here concluded that how the students perceive the environment (scene), particularly where there is ample opportunity for interacting with peers and/or teachers, frames the ways in which they approach the activities associated with online learning. Students who perceived that interacting provides opportunities to further their own understanding appeared more inclined to participate and thus provide further opportunities for dialogic mediation of the knowledge construction process.

### 6.5.4 Epistemic authenticity

Where dialogic mediation was seen as being most beneficial, that is providing opportunities to further engage in knowledge building, the processes opened up for individual students to engage at deeper levels in the constructive process of thinking, acting and, as a consequence, learning. These opportunities are examples of epistemic authenticity, in which the knowledge being built is directly related to purpose of
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engagement. Conversations were beneficial in establishing epistemic authenticity for participants. Epistemic authenticity relates to the “significant and serious epistemic roles” for students when related to serious instructional goals (Nystrand, 1997 p72). For students, asking authentic questions (acts), directly related to their current problems, enables a deeper approach to learning (agency) and moving them beyond the proverbial ‘empty vessel’ being filled with knowledge. Students, such as Respondent #94, mentioned earlier, commented on notions of authenticity with reference to how teachers engage with the list:

Some lecturers treat it like extended classes while some treat it like a chore.  
[Resp. #94, ComProgC, SQA]

Approximately ten percent of students commented on their perception of inadequate participation by a teacher. Their claims apparently have some basis, because the difference between participation levels of teachers ranged from 5 messages per teacher to 50 messages per teacher. Clearly, respondent #94’s comment is indicative of one of the problems of online learning environments, namely, that participation by teachers is as necessary here as it is in the classroom, albeit perhaps of a different kind and for different purposes. One list in particular, ComProgC, evidenced the kind of participation by a teacher that facilitated the learning of students:

[ComProgC] is the best group I have ever participated in. It is highly interactive, and is made much more so by very active participation of the lecturer […]  
[Resp. #31, MathComp, ComProgA]

This exemplifies that students are aware of the ‘presence’ of the teacher in the ‘patterns’ they create as noted by Hayles (1999). However, Hayles also noted that there is some loss in interacting with the disembodied (virtual) human via a mediated environment. However, for these students, particularly externally enrolled, the replacement of real interaction with virtual, where the real was unattainable, is a necessarily positive advance in their learning situation. For students who did not have the opportunity to interact in a face-to-face situation, this replacement provides opportunities that would not otherwise have occurred.

Consequently, the data gathered in this investigation suggest that epistemic authenticity is enhanced by both the teacher’s ‘dedicated’ participation and by the students’ engagement in an environment designed to allow participation. This enhances the co-construction of knowledge through the social practices of engaging in dialogic
authenticity. Dialogic authenticity, in the instances reported here, seems to be enhanced through the genres used with mediation. It follows that the kinds of support provided by the teacher may enable greater interactivity and intersubjectivity.

6.5.5 Mediated genres

The genres available to students to use in learning are often acquired in face-to-face situations, such as through classroom-based interactions. The mediation by computer (agency) requires the basic structure of utterances (acts) to be ‘uttered in writing’. In Chapter Two, it was postulated that a learner in a text-based electronically-mediated environment (scene) may need to reform their utterances and that new forms of generic utterances are opened within these newer environments. The new genres, in particular, relate to the contextualisation of moods within messages. Beyond these are the situated or contextually specific utterances that are favoured in electronic-based interactions. Legitimate peripheral participation, as discussed by Lave and Wegner (1991), was postulated as being a basis for understanding learning in context in which novices and experts directly interact inter-personally. Thus, more complex aspects of tasks are introduced leading the novice from primary genres to secondary genres demonstrated by the expert.

The students in this study often linked their participation to their purpose for involvement. For instance, the purpose of participation for respondent #34 was:

That I will be presented with an opportunity to engage in a process of being helped, and sometimes helping others. To use information sharing. [Resp. #34, ComProgA]

From this, it may be inferred that this student is aware of their novice status and expects situated and contextually specific information to be provided to assist their learning. There is also the recognition that in some instances, the student may be further advanced in learning of content than others and thus able to undertake the role of expert for other students. These contextually specific goals of interaction of helping and being helped by peers, related to specific genres of speech associated with being a novice or an expert.

Further, Thomson and Murachver (2001) and Rossetti (1998) identified specific instances of variations in conversational style and other communicative features that may be related to the gender of the participant. In the courses investigated here,
different levels and kinds of interactions were identified between male and female participants. Female participants typically initiated more conversations and may have access to a distinct range of genres that relate to gaining and providing assistance that may be more community oriented. Thus, the lower numbers of females within these courses might result in a different set of mediated genres being deployed. In an environment with more equal numbers of males and females, the style and frequency of interactions may also differ.

Therefore, the genres available to individuals and indeed to distinct groups of individuals may be affected by a variety of factors. Among these are the status of the individual along the novice/expert continuum and the individual’s gender. The range of effects of these factors will likely be diverse, resulting in differently constituted environments with each implementation of an environment. Awareness of these factors is the minimal requirement for the operation of an online learning environment, while understanding may contribute to higher levels of potential interactions among participants.

6.6 Mediating mediation

Mediated mediation refers to the multiple levels of mediation that come between two individuals in interacting or between individuals and artefacts within some setting. In a face-to-face situation, mediation could be a comparatively simple form of mediation through speech. This simpler form is open to clarification of meaning and an immediacy that may result directly in a form of shared understanding, the basis for intersubjectivity upon which further interaction and learning might be premised. However, where the mediation is by text, the resultant meaning may be obscured and shared understanding harder to achieve. Adding more layers, such as the computer and the Internet, places additional burdens upon meaning-making and the securing of intersubjectivity. These additional layers, in effect, mediate the mediation of learning, which in turn is mediated by speech.

Thus, in Chapter Two, it was held that mediated learning requires a level of competence with an intervening technology, specifically the screenface, which incorporates the computer, software and the Internet. So, not only does the technology mediate interactions, but the textual nature of the interactions forms another level of mediation between agents. The nature of interactions within a face-to-face environment
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is disrupted by the textual nature of these interactions in an online environment such that utterances are no longer simply ‘uttered’ but must be ‘uttered in writing’, as stated in Chapter Two. This has effects on both the immediacy of interactions and on intersubjectivity between agents.

6.6.1 Immediacy

Immediacy is an important concept in terms of learning (act), particularly learning which might be between the social partners (agents) in face-to-face situations (scenes). Immediacy affects the ebb and flow of ideas between individuals who are able to build on each other’s utterances in an epistemically authentic way. The distinctions between environments, such as face-to-face and online text-based environments, affect the flow of ideas because they require different levels of competence with intervening technologies. However, it is the effect on the immediacy of interactions that is of concern here. This was shown to be most clearly manifested in the differences in how students approached and constructed the learning environment. In the previous chapter, it was noted that students read messages more frequently than posting messages. The lowest level of reading among students in a course was 85%, which indicated a browsing style of interaction with the lists. This style of peripheral interaction may lack immediacy, although many students reported positive impacts of this style on their learning. This is particularly evident in a comment from respondent #21 who viewed the list positively by stating that the list:

[…] allows you to see answers to questions you didn't think to ask. [Resp. #21, MathComp, ComProgA]

This kind of activity, of being prompted with new, unexpected questions, adds to the learning potential and has an inherent form of immediacy. Some students apparently appreciate the variations in the ways in which the lists may be used, for example:

[…] they are an open forum where any student can feel comfortable posting, responding or just reading messages. [Resp. #115, ComProgC, SQA]

This respondent illustrates the extent of the variations in the ways in which students might use email discussion lists. The multiple forms of immediacy that discussion lists may provide are enhancing students’ potential learning. These opportunities to engage differentially may lead to further opportunities to establish a
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form of emerging intersubjectivity. Therefore, it was shown that while the immediacy of interactions may be affected by the environment, the technology and other factors, the effect on the immediacy of learning may be less apparent and may still allow intersubjectivity to evolve.

6.6.2 Intersubjectivity

Intersubjectivity, the shared understanding between participants, has been postulated as evolving best through face-to-face interpersonal interactions (Rogoff, 1990, Wertsch, 1998). In learning environments (scenes), particularly the classroom, it is the relationship and interactions (acts) between teacher and learner (agents and co-agents) (Newman et al., 1989), which assist in achieving intersubjectivity through the learner being able to understand what the teacher proposes. It was postulated in Chapter Two that the less visible, immediate and accessible forms of interaction that comprise communication in an electronically mediated environment may be less conducive to a high degree of intersubjectivity, because there are few opportunities to engage in interaction and monitor the response of participants in the interaction.

The findings in Chapter Five suggested students being enabled by contact with other students, for instance respondent #26 demonstrates an initial effect of engaging in an online environment:

Thoughts are triggered by other questions. It causes you to think about items not prev considered. [Resp. #26, ComProgA]

This student is enabled for further learning beyond current problems by witnessing interactions between other individuals. However, this is not an example of intersubjectivity, only an indication that understandings may change as a result of interaction. Respondent #50 who discusses the outcomes of communication via online interaction further demonstrates this:

[…] provides a line of communcation [sic] to lecturers and other students for external students. Some emails posted answer questions I also had or confirm my understanding about things. It also helps to see that other students are having trouble with the same thing, and helps you guage [sic] what level you are at. (ie If you know the answer to the question they asked) [Resp. #50, MathComp, ComProgA]

This student demonstrates how their understanding of topic matter is directly influenced by their participation, whether peripheral or central. These initial stages of
intersubjectivity, that is, realising there are other views, are important because intersubjectivity is dependent upon the ability of individuals to modify their position. This is further highlighted by respondent #55 whose response indicated an emergent level of intersubjectivity. This student reported the list provided:

Answers to questions. Clarification of ambiguities. The chance to assist others. Sharing of trouble, thoughts and ideas with people having similar interests. [Resp. #55, ComProgC]

‘The sharing of trouble, thoughts and ideas’ is central to intersubjectivity, which cannot happen without this sharing. This indicates that reciprocal bases for interaction exist which negotiate with, and develop a shared understanding of, the course activities. This may lead to intersubjectivity over time; however, the short period in which the lists are established may not be sufficient for a high level of intersubjectivity to occur. Newman, et al, (1989) holds that through interactions intersubjectivity is achieved over time.

The following response from respondent #93 is particularly indicative of emerging intersubjectivity between participants in the discussion lists. This student demonstrates the concept of sharing an understanding that also aids the understanding of the sharer;

One is able to read questions posed by other students and the answers given, sometimes by lecturers. Answering other's questions helps your knowledge to "gel" in your own mind. If you can explain something to someone then you understand it. […] [Resp. #93, ComProgC]

This response demonstrates that opportunities to learn are enhanced by the chance to engage in conversations about a topic.

Thus, intersubjectivity may be achieved in incremental, partial, emergent forms through interactions between individuals in discussion lists. The loss of immediacy in an online learning environment is, in some ways, compensated for through the potential for ongoing engagement between agents, via access to lists of questions and responses that scaffold learners’ development, beyond the moment of the actual interaction. It is through these contributions that the online learning environments investigated in this study represent an important addition to learning activities, because students separated from the university by distance and time have additional methods of engaging with their peers.
6.7 Individual learning environments

From the above discussion, it is apparent that human agency is underscored because it influences all other elements. The scenic element is also extremely important, defining as it does many of the acts that can be undertaken. As discussed previously, the scene is highly influential on the available acts, but in the mediated environment these acts cannot occur without the agency of the computer and networked capabilities. Thus, the how (agency) and the where (scene) become central to discussions of online learning (environments). Discussions that reduce the significance of these elements of the Pentad may fail to fully appreciate the implications for the agent (students) of learning in a mediated environment. These elements are defining for the agent, whose sole contact with others may be through the screenface, the mediated environment.

The mediated online environment as elaborated in this chapter influences our understandings of the potentials for learning in mediated environments, while our perceptions of face-to-face environments facilitate these potentials. In some ways, a face-to-face environment is simplistically mediated by speech and language, while the online environment was shown to add layers of mediation that may either disrupt or facilitate learning, particularly for students whose main contact with the university is electronically mediated. Each individual may need to reform their modes of negotiation to accommodate variations in the forms of mediation available to them. In this way, the discussion in this chapter has elaborated the variations in forms of mediated environments and shown how individuals negotiate those forms to their benefit.

The situational contribution of agency and scene as advanced by the use of Burke’s Pentad (1969) has contributed to understanding the agent, their purpose and their acts. This framework allows comparison with different theoretical frameworks as demonstrated here, through comparison with activity systems and situated learning.

The analysis of email discussion lists has furthered an appreciation of interactions, structured processes and Vygotsky’s (1978) Zone of Proximal Development. This latter concept, the Zone of Proximal Development was postulated in a new form, the Zone of Learning Capability, which emphasises the students’ role in learning as an active participant. The Pentad also furthers an appreciation of mediation through its multiple forms, through speech and its dialogic properties, the genres available within a mediated environment, and contributes to the epistemic authenticity. The mediation of mediation,
that is, the multiple ways in which learning is mediated, assists in appreciation of the immediacy of mediated interactions and of intersubjectivity.

In the final chapter that follows, the conceptual and procedural contributions of this investigation are synthesised and some deductions are made about the implications arising from this investigation.
7. Learning in a mediated online environment

7.1 Revisiting the research

This final chapter integrates and synthesises findings, advances deductions and outlines the contributions of this dissertation. Online learning is a ‘hot topic’ (EdNA, 2004) that has proponents, adversaries and spectators. In diverse ways, the research effort to date into online learning has attempted to identify the potential of online learning arrangements for facilitating learning. This dissertation contributes to and extends the contributions of this earlier work in ways that are distinct and may well represent a fresh analysis of elaborating and evaluating both online learning environments, specifically the use of email discussion lists, and their pedagogic properties.

This chapter commences by presenting an overview of the research activities that comprised the conceptual and practical inquiries constituting this dissertation. The purpose of the study is reiterated, followed by a succinct summary of the research processes. The proposed procedural and conceptual contributions are then advanced in sections 7.2 and 7.3 respectively. A synthesis of contributions is presented and the implications of these findings are discussed in section 7.4. The chapter concludes with some suggestions for potential studies that could follow from and expand on the findings of this investigation.

7.1.1 Purpose of the research

This thesis began by proposing that student-teacher and student-student interactions must be fostered in order for effective online learning to occur. The specific focus of this investigation was on how asynchronous communication technologies, such as email, contribute to an interactive learning environment in particular ways that have generated particular kinds of pedagogic practices and which facilitate rich learning. This underlying argument requires greater understanding of relationships and outcomes between and among humans and nonhuman artefacts than has previously been available. The research was initiated by a concern that, despite the widespread uptake of online learning within higher education, there was insufficient evidence that the kinds of communication processes and pedagogic properties inherent in electronic networking were fully understood. In other words, what pedagogic principles apply to the use
of email discussion lists within online learning environments to secure effective learning.

This investigation therefore sought to determine what new understandings could result from stepping outside the roles of ‘advocate’, ‘acceptor’ or ‘refuser’, as outlined in Chapter One, in order to understand, in greater depth than is currently available, the basis for and means by which students interact and engage in activities for learning in online learning environments and the degree to which these contribute to rich learning outcomes. Questioning the use of technology has led to new ways of understanding online learning – its physicality, its potential and its role in education in the future. The research addresses the question of ‘what is involved, when we say what people are doing and why they are doing it?’ (Burke, 1969, p xv).

In order to understand the pedagogic possibilities of engaging and interacting in an online learning course of study, the elements of and relationships among Burke’s Pentad (i.e. scene, agent, act, agency and purpose) were deployed to analyse how online learning environments, with particular focus on asynchronous communication, work for the student and the teacher, and assist in the identification and establishment of pre-conditions that must be met for teaching online to result in learning online.

### 7.1.2 Interconnected studies or mediational means of research

The practical investigation comprised a case study framework of three interconnected studies, described in Chapter Three, which investigated students’ use of email discussion lists. The first study incorporated and analysed data measuring participation in quantitative ways. It established the rates at which students participated in ten online courses at an Australian university. The study permitted the selection of four courses for further investigation. This selection was based primarily on the volume of email, that is, the total number of messages sent to each list, and the proportion of enrolled students who subscribed to the list. This process secured four very different lists for analysis in the subsequent two studies.

Study Two incorporated qualitative data about learners’ interactions in the form of the messages sent to the four email lists in courses selected for investigation in Study One. Messages were categorised by sender, time, date, and other descriptive features and were then analysed for their purpose as well as other communicative features. This
study began to elaborate the activities and interactions students engage in, in an online learning environment, through the use of Burke’s (1969) Pentad.

Study Three was a survey of subscribers to the four lists. The survey addressed issues associated with interactions such as the respondents’ perception of the lists, their frequency of engaging with the list and a set of questions concerning their communicative abilities. The survey highlighted the students’ perceptions of the environment and, in some ways, their intentions and purposes for being involved in the online learning environment.

Collectively, the three studies permitted a deep exploration of what constitutes participation in an online learning environment, the kind of interactions that occurred and elaborated the pedagogic properties of these four courses. The investigation is contextualised within sociocultural theories and utilises Burke’s (1969) Pentad to elicit understandings of motives for engaging in online learning environments.

Although not advanced as a set of generalised principles, the contributions from the study of the four courses and the students who participated in them can be seen as having both procedural and conceptual dimensions. The procedural contributions can be seen as identifying and illuminating sets of pedagogic practices that are presented as a tentative means by which online learning environments might be improved. Conceptual contributions are those that have been identified as elaborating the kinds of interactions and activities that are likely to either secure or frustrate the learning of targeted knowledge, as well as the processes through which these interactions were identified.

7.2 Principal procedural findings

The findings described in Chapters Four and Five and advanced in Chapter Six have implications for teaching and learning in the form of pedagogic practices that underpin online learning arrangements. These findings are summarised here with reference to the literature presented in Chapter Two and the previous research and concepts outlined in Chapter One.
7.2.1 Utility of Burke’s Pentad to the analysis

Burke’s (1969) Pentad appears to be a valid framework within which to analyse learning environments. It provides specific attention to the location in which an activity takes place, as well as the individuals, the means of mediation of the activities, the activities and interactions that occur and the purpose for which the individuals are participating in the activities. In this way, it goes beyond many current theories that emphasise situational factors. That is, by including the kinds of interactions which not only occur in actively constituting a learning environment, this framework represents a more encompassing explanation of learning environments than those privileging the physicality or the activities of the particular setting (eg communities of practice and activity systems). This holistic approach provides insights that may not be available using other frameworks. The analysis demonstrated the applicability of the Pentad for analysing virtual environments, particularly incorporating the scenic element.

Comparisons among learning environments were facilitated by a Pentadic Analysis, because each example was viewed through the same lens that can be applied to different environments providing clearer evidence of which configuration best supports learning for a particular student or group of students. This research may constitute the first of a series of analyses of online learning environments which all differ in their implementation. However, the speed with which technology evolves means an increasing need to establish those aspects that do facilitate student learning. The Pentadic Analysis of email discussion lists – using Burke’s (1969) elements – in this research is perhaps a solid foundation upon which to build a comparative analysis of learning environments for distinct groups of students in disparate disciplines. As one of the inferences of this study was that not all scenes provide equal opportunity for agents to act, further analyses which build upon the current knowledge of online and other learning environments are possible.

Thus, beyond utility in describing communication processes, Burke’s (1969) Pentadic scheme provides a means of describing learning environments and illuminating their pedagogic possibilities and practices. While this has been positively appraised in its efficacy of illuminating online learning environments, it is postulated to have a wider application, such as in face-to-face teaching.
7.2.2 The importance of framing

Framing appears to be highly influential on the evolution of the focussed use of lists by students during a semester. The term framing was used to denote the parameters of the scene that comprises the discussion lists and also the activities that are considered appropriate in directing learners to engage with the knowledge to be learnt. The framing sets the boundaries for what is possible and allowable within the learning environment. Extensive positive framing appears to have a positive effect on the students engaged in the learning environment.

It was noted in this study that the types of interactions favoured by students tend to revolve around course-specific objectives. That is, their learning activities were focused on achieving the course objectives and gaining a pass mark for the course. Thus, gaining help (i.e. working towards a ‘pass’ mark) for both novices and more advanced students can be a specific form of assistance that students require. ‘Framing’ essentially identifies that specific acts are allowable and thus intended for learning. It can assist in creating a setting that can guide students towards the intended learning outcomes.

The framing of lists appeared to influence both the number of participants who engaged in the environment and the number of messages that were facilitative of learning. This suggests that framing is one of the more influential aspects of the environment upon student participation. That is, it offers a way that ensures the effectiveness of what is essentially an independent learning process.

However, because students engaged in electronically mediated environments necessarily exercise autonomy and agency in directing their learning-related activities, the program design and enactment needs to guide the students’ activities through effective framing. Thus, framing should seek to guide and assist students’ engagement in activity towards the targeted learning.

7.2.3 Vicarious participation as a pedagogic act

This research suggests that the browsing style of interaction as exhibited by non-participative students establishes them as part of the scene, and that browsing messages is a legitimate and active form of pedagogic practice. This is important because non-participative students, while not visibly contributing in the form of posting messages to
the list, are nevertheless actively constructing knowledge based on the interactions of other students. Many of the students were aware of the different ways of enacting participation as either interacting directly with peers and tutors, or interacting indirectly. This was posited as being similar to Lave and Wenger’s (1991 p35) notion of peripheral participation where individuals interact in “multiple, varied, more- or less-engaged and -inclusive ways”.

The types of interaction were analysed in Chapter Five in terms of the agent’s level of participation. Full participants were those students who read and posted messages as well as responding to other students’ messages. On the other hand, some participants interacted vicariously by browsing messages, either awaiting answers to questions that had already been posted or searching the collected messages for information about their current problems. As a result, their learning was supported vicariously through their observing activities of other students (that is, co-agents). In effect, they employed a form distal interaction and participation, rather than being central participants. These individuals for whom interaction is more with the artefact than with their peers thus displayed a variety of interaction that has been seen as less valid and, indeed, not part of the learning environment (Graham and Scarborough, 1999), particularly where participation equals performance and visibility equals presence. Moreover, those participating more fully are seen to be engaging in the kinds of cognitive activities that are likely to be conducive to developing rich learning. However, Hatano and Inagaki (1991) and Sutton (2001) describe vicarious interactors as capable of learning from sitting on the sidelines. In this research, it was found that the vicarious interactors gained considerably from this form of engagement, particularly when similar questions arose for multiple students and many students regarded multiple postings of these questions as negative.

The relationship that students who interact vicariously have with the list appears to function more with the technology as mediator than technology as facilitator. This means that rather than the technology facilitating contact between peers, the technology functions to come between the individual and their peers; the screenface becomes opaque. This relationship is more complex and perhaps incorporates a distinct form of negotiation by the vicarious interactor with the technology. This may relate to Wertsch’s (1998) discussion of mastery and/or appropriation, whereby vicarious interactors may have mastered the technology, but not appropriated its value. For some
individuals in the study, the technology took on a more transparent role in their interactions, the layers of mediation, in effect, merging into the screenface in a seamless meld of technology. For others in the study, the layers of mediation (e.g. the agent acting in the role of learner, with previous experiences of learning acting with a computer connected to the Internet providing access to learning material) were less transparent, and thus disrupting for them.

Regardless of how vicarious participants interacted, whether by reactively awaiting answers to questions or actively searching the accumulated messages, they reported gaining in their learning from utilising their own particular learning patterns within the online environment. With each successive engagement, these individuals progressed through a process of “participatory appropriation” (Rogoff, 1995 p142) that is, it prepared them for subsequent interactions and activities associated with their intended learning but still within their own zone of learning capability.

As a consequence of the research, vicarious participants are seen as affecting their own development through a kind of epistemological action that is supported by others’ contribution to the email discussion list. In this way, the artefact comprising the email list provides an ongoing form of mediation, which is accessible to learners. This finding has analogies elsewhere. As Biggs (1996) has reported, despite the apparently passive classroom behaviours of students from Confucian heritage cultures, they are still able to learn richly and deeply. Biggs’ (1996) findings were used to suggest that it was clearly a mistake to believe that only through the kind of engagement that is privileged by Western schools (i.e. students actively engaged in problem-solving tasks) could rich learning be secured. Indeed, he showed that learning through apparently passive engagement with knowledge could result in rich learning. Here, an analogous finding is revealed: the actions of vicarious learners in their peripheral form of participation and use of available artefacts provide a pedagogic practice that can render rich learning outcomes.

Vicarious strategies of engagement may well be as conducive of rich learning outcomes as more apparently active and engaged forms of interaction. That is, desired learning outcomes can be achieved through diverse forms of interaction, with different levels of apparent activity playing particular roles depending upon students’ readiness or need.
7.3 Principal conceptual findings

Conceptual contributions are those that have been identified as elaborating the kinds of interactions and activities that are likely to either secure or frustrate the learning of targeted knowledge, as well as the processes through which these interactions were identified. These contributions are outlined below.

7.3.1 Zone of learning capability

Laurillard’s (1993) conception of teaching at tertiary level was presented as a conversation between agents – teachers and students. This kind of knowledge co-construction was a strong feature of the discussion lists and is indicative of the ‘serious epistemic roles’ (Nystrand, 1997) that students need in order to engage in deeper learning activities. Deeper learning activities involved in conversations are an indication of a shift, from teachers to students (Piburn and Middleton, 1998), in the accountability for constructing knowledge. Students may then become engaged within their Zone of Learning Capability, which is analogous to Vygotsky’s (1978) ‘Zone of Proximal Development’. However, in the Zone of Learning Capability the student is enabled to take the actions necessary to facilitate their own learning rather than being led to a pre-determined point of knowledge. It emphasises students’ epistemic motivation and agency. Epistemic motivation, or the desire to know (Hatano and Inagaki, 1991), as discussed in Chapter Six, is central to understanding the Zone of Learning Capability, because the Zone of Learning Capability describes the motivation to learn rather than a state of development of skills or knowledge. In this study, it was found that students’ multiple ways of working provided insight into the range of techniques that students used to facilitate their learning, that is, that many students involved in the discussion list took actions that facilitated their individual learning style.

Conversations are distinct patterns that occur within an online environment (Kear, 2001) and their presence is indicative of participants’ desire to learn. Consequently, conversations need to be fostered through the mediational form that is employed to connect students to their peers and teachers. However, although learning may arise through conversations, there can be no guarantee that the kind of learning that will occur would be directed to the learning targeted by or intended in the course. A teacher in face-to-face situations may be aware of the ebb and flow of interaction between students, between those for whom the Zone of Learning Capability is small and those
for whom there is a greater leap to achieve the construction of knowledge required to be learnt. Conversations are central to this developmental process, as highlighted by Laurillard (1993) above, because the interplay between questions and answers through which conversation is manifest visibly displays the co-construction of knowledge between participants. Dialogicity through conversation is central to students’ ability to engage in knowledge co-construction, because meaning is continually structured and restructured through negotiation between participants. These requirements are no less important in the electronically mediated environment and may become more important because of the reduction in other social cues.

As seen in the context of this investigation, students have multiple ways of interacting with the email discussion list, and these variations in the ways students interact need to be accounted for in designing and planning for an online learning environment. Therefore, while it may appear important to manage and direct the students’ interactions to the kind of learning activities that can support the achievement of the intended learning goals, students who do not engage at this level may still be ‘actively’ participating in knowledge construction, within their zone of learning capability.

Individuals as agents engaging with artefacts and peers can extend the concept of Vygotsky’s Zone of Proximal Development. Therefore, this concept is not restricted to something that is the province of and requires the support of a more expert other. Instead, the individual as active agent working distally with artefacts and peers is able to extend the scope of the potential learning to their Zone of Learning Capability.

### 7.3.2 Influence of agents

It was found that although the success of an online learning environment depends on the agents, these must include both students and teachers who create a pattern of participation and engagement through their presence. The pattern emerges in the interactions and the messages sent between co-agents: that is through conversations. The presence of an agent is mediationally constituted by their interactions. So for instance, the dedicated tutor and/or student who posted numerous messages to the list was visible in the environment and consequently shaped the interactions. The online learning environment has personal-dependent dimensions, and the characteristics of independence and interdependence of online learning environments suggest a strong
emphasis on the individual and their agency in accounts and evaluation of the success of online learning environments. Thus, students who were interacting (i.e. asking questions) created the learning environment through their interactions. Teachers, therefore, were reported as being highly visible to the students, who actively sought out patterns such as status hierarchies in the messages with which they could interact. There was, in the study, often more value placed on the teacher’s messages than those from other students (see Chapter Five). The teacher’s presence is perhaps more important because their pattern, their interaction, is potentially more facilitative of learning. The students’ perception of the activity of teachers on the list appears to be influential in their (students’) negotiation of the learning environment. For instance, both seeing messages from the teacher and knowing that a reply is highly probable may induce students to seek answers to questions they have through the list.

The variation between the ways in which teachers participated directly influenced the success of the discussion list and students’ perceptions of the learning potential. A higher level of teacher interaction enhanced the epistemic authenticity of the learning environment and the co-construction of knowledge through the dialogicity that is made available to students within the learning environment.

Because the presence of individuals was only evident in the messages they sent, vicarious interactors may not appear to be present on the list. However, many of the students recognised the diverse ways of interacting with the discussion lists and the impact that would occur with equal participation by all students. Thus, the various ways of interacting that the students exhibited were facilitative of their relationship to the learning environment, rather than being a deluge of interactive possibilities that could potentially overwhelm students with too many options. As noted in Chapter Five, the agent in a virtual scene became a vague concept because of the mediationally constituted presence discussed above. Consequently, a vague teacher presence, as was evident in the ‘self-help’ discussion lists, negates much of the learning potential for students. For students, teacher presence exists to provide assistance with problems that may be outside their Zone of Proximal Development where they need assistance to reach the solution, but within their Zone of Learning Capability where they can ask questions to assist in reaching a solution. A teacher, whose presence is minimal, was shown to impede the learning processes of these students. Indeed, success of these
Learning in mediated environments

online environments was dependent on the agents, both teachers and students, although teacher influence was reported to be greater.

Given the nature of online learning arrangements, the pedagogic practices of the learners are centred more on their readiness and capacities as they enact these arrangements, than on those practices intended by designers and teachers. Hence, the concept of pedagogy here resides as much within students’ activities as with those who design and enact arrangements with specific intentions for electronically mediated learning courses.

7.4 Confirmation of current beliefs

That these students took advantage of the ‘anywhere/anytime’ potential of online learning environments emphasises the potential utility of online learning as a highly accessible pedagogic practice. Students were able to engage by sending messages every day of the week and every hour of the day. For the majority of students, access to the learning environment was from their own home computer, but also from university, their workplace and friends’ computers. This means that students are working in an essentially familiar space, one that they may appropriate and make their own. This further facilitates their appropriation of the technology and of the learning environment.

The artefact comprising email discussion lists constitutes a significant form of scaffolding that students can access at will, and for relational purposes according to their particular needs at a given time, including their readiness. This form of scaffolding takes learning guidance beyond interpersonal interactions, and acknowledges human-artefact interactions as a form of proximal guidance.

Students who subscribed to the discussion lists also demonstrated higher rates of successful completion of their courses than those who did not subscribe. Thus, participating in an online learning environment is predictive of learning the kinds of knowledge that are assessed through courses. There is a positive influence of subscription in terms of completing and passing courses and getting help with assignments, with a greater proportion of subscribed students passing than non-subscribed students.

Further, those students geographically and/or temporally separated from the university, that is students who enrol in external mode because of distance or time
constraints, appeared more likely to be subscribed than students co-located. This means that the perception of online learning environments as equivalent of distance learning appears to have some foundation, although they offer greater scope than simply providing opportunities for external students. The provision of an online learning environment for these externally enrolled students has a positive effect on their ability to interact with their peers. Therefore the findings of the study go a long way to support existing knowledge about online learning. Yet, more than simply confirming what is known, the study identified new bases from which to consider online learning.

While active engagement with learning materials, peers and teachers is associated with rich learning, there are different kinds of engagement other than generating and answering questions that can lead to rich learning outcomes. So the principle of engagement for different purposes at different times stands, but is extended.

### 7.5 Complexity of online learning environments

Students appear to influence the environment through active interaction, autonomy and agency. Likewise, vicarious students’ activities may appear passive, but may indeed be active in a way similar to Confucian heritage students (Biggs, 1987, 1996). The variations in the ways students engage with the environment are postulated as a Zone of Learning Capability wherein students take actions to facilitate their learning. Yet the influence of the teacher/designer of courses is also important, as they appear to structure the environment through framing, which can potentially clash with students’ learning styles. The findings suggest that teachers can scaffold support in both positive and negative ways. This was elicited through the analysis provided by Burke’s (1969) Pentadic elements, which appears to be useful in furthering an appreciation of human-artefact interactions as demonstrated by these findings.

If the examples of the four discussion lists are indicative of conditions elsewhere, online learning environments represent diverse pedagogic practices from both teachers’ and students’ perspectives. The current philosophy of learning, the flexible learning model defined in Chapter One as the use of communication technologies in learning together with interactive technologies (Taylor and Swannell, 1997), is central to learning in online environments. This flexibility is not solely in the ways in which information is presented for construction into knowledge, but must facilitate each individual’s way of working. This research has shown that students have multiple ways
of approaching the environment, from the full participant who engages in on-going interactions to the browsing learner, who simply reads the messages. Between these are various levels of vicarious learners who anticipate solutions to their problems and those who actively seek such solutions in the accumulated messages.

As mentioned in Chapter Six and above, this relates to the zone of learning capability, which is analogous to Vygotsky’s (1978) Zone of Proximal Development, but which is more attuned to the capacity of an individual adult to engage in activities that enhance their learning potential. This means that attempts to mandate participation, in order for teachers to 'see' that students are learning or at least engaged in activities that may lead to learning, may disrupt learning for a student whose way of learning is less overt and who prefers a more vicarious approach. Here, the concept of engagement relates to an individual student’s way of working within the framing provided for organising and guiding learning.

Students whose zone of learning capability extends toward full participation create the richness of the learning environment for vicarious learners. It is these students, whose negotiation of the mediated environment parallels expectations of teachers, who appear to be successful. Through full engagement with the dialogic possibilities of interactive media, these students create co-constructive opportunities.

For the learners, negotiating an online learning environment requires understanding their own ways of learning. For the externally enrolled students in the four courses, the opportunities afforded by engagement online are multiple and may result in a more appropriate set of processes with which to facilitate their learning. These students appear more likely to engage online, perhaps because the co-constructive aspects of dialogue are now available to them. This is a considerable improvement over previous generations of distance learning as highlighted in Chapter One.

However, the students in the study appear to view their online interactions as being within the context of a ‘classroom metaphor’ (Wilson, 1995), perhaps due to their previous experience with intentionally organised learning. Previous experience appears to be a distinct layer within the multiple mediational means that Wertsch (1998) depicted as multivoicedness – that is, the voices of agents and tools in harmony or discordance. Thus, the voice of previous experience was evident in students approaches to the online learning environment. For students, an online learning environment is an effective pedagogic tool, which can be used by both students distanced from the
university as well as those co-located. The opportunities afforded by the environment are thus applicable to all students.

For the teachers in the study, an online learning environment needs to be designed to facilitate learning for the student. This is particularly relevant in a mediated environment where the individual has greater responsibility for the construction of knowledge. Thus, teachers need to consider whether the implementation supports the epistemic needs of the students. This means that the way in which a teacher approaches the environment must incorporate framing adequate to provide serious roles for students. This requires that they become part of the environment, what students referred to as ‘dedicated tutors’, thereby ensuring that when students learning requirements are expressed, answers to questions are forthcoming.

Similarly, the ways in which students might approach the learning environment, as fully or vicariously engaged, mean that teachers need to grant these epistemic roles full validity. Some previous research has relegated students whose participation was not observable to non-participant status. For instance, Graham and Scarborough (1999 online) state that a “learner is regarded as present online only when he or she makes a comment” because “[a]ctive participation strengthens learning”. However, the engagement by many of the vicarious learners in this research is active in their search for solutions to their current problems. This means that the expectations by teachers that students must participate may, in fact, negate the individual student’s way of learning and be regarded as ‘busy work’.

The research provides evidence that the interactions that students engage in facilitate their learning and that of the more vicarious participants. Student use of email is multi-layered and diverse. Students able to work in their own ways found the technology beneficial, however teacher participation in response to students’ needs must be central. Students’ purpose in utilising an interactive forum is, in general, specifically tied to the learning objectives. Teachers’ purposes appear to be more diverse resulting in a sense of cross-purpose for the provision of the learning environment.

Thus the levels of student participation appear to be tied to the framing of the list’s purpose, with more students being involved where the purpose was specifically tied to the learning objectives. Framing which was not so tightly bound, as in ‘self-help’ appeared to have a negative impact on student participation. In this way, the educational potential of interactions in an online environment, is directly related to the
stated purpose of their provision. This means that online learning environments and the purpose for which they are used must be clearly stated and framed in positive ways prior to their access by students. The findings suggest that teachers who approach the environment with a vague sense of the purpose may fail to provide rich learning experiences necessary for students to learn. However, clear directions from the teacher whose presence is central to the functioning of the environment will provide a more facilitative environment for students.

Earlier research (Thomas et al., 1996) had noted that status hierarchies exist within an online forum. These hierarchies were also evident in this research. However, many students reported being less concerned about these hierarchies, seeing the list as a place where they could obtain the necessary assistance to further their knowledge construction. In this way, while many of the students placed higher value on postings from teachers, others valued the co-constructive potentials of interacting with their peers, because of their development to the stated goals of the course: the assessment requirements.

The heuristic proposed in Chapter One that participatory online environments should be limited in size to 50 (Turoff et al., 1999) appears to be guided by the requirement that all students will actively participate. However, it was found that in an environment where students work in their unique and idiosyncratic zone of learning capability and within their own way of learning, this rule appears less hard and fast. The groups studied here, involved between 90 and 324 students subscribed to the environment. However, the patterns of use and ways of engaging with the technology were varied. Thus, where participation is not mandatory, that is where the environment is designed to work with students rather than for the teacher, students’ negotiation of the environment leads to a more manageable form of interactive forum.

In summary, then, this research contributes a deeper understanding of aspects of the use of online learning environments. It has implications for policy and practice at the individual level for both teachers and learners. These are:

- Recognition by teachers of diverse learning styles employed by students;
- Recognition of the importance of framing participation such that students and teachers work toward a common goal within the course objectives;
• Recognition by teachers of previous experiences of students and how these impact the students’ inclination to engage with the environment;

• Teachers must provide clear direction for the purpose of engaging in the online environment and be clear about their role; and

• Active participants are not necessarily the only ones engaged richly in the online learning environment, students apparently non-active may still be deeply involved with their learning.

7.6 Future directions for research

Beyond confirming many current beliefs of online learning, this dissertation has contributed to the growing understanding of online learning environments. Five core areas, each related to one or more of the principal findings listed above, are identified as requiring further inquiry.

7.6.1 Elaboration, illumination and analysis of learning environments

As already highlighted, Burke’s Pentadic Analysis provides a solid foundation for analysing online learning environments and provides the kind of comprehensive analysis necessary for the further development of pedagogically sustainable learning processes. The Pentad’s elegance provides a simple heuristic for analysing processes that are central to learning activities. The holistic nature of the Pentadic elements ensures comprehensive attention to components of the learning environment that may be neglected using other frameworks. Potential studies following from this one include similar analyses of online forums and of electronic systems that are used to manage learning (i.e Blackboard). These analyses may find similar patterns to those found here, although the implications for students may well be fundamentally different. These differences and similarities may provide bases for the effective implementation of a learning environment for specific disciplines and diverse student groups. Focuses for the future include conducting similarly framed research on learning environments offered by other institutions, that rely more heavily on proprietary software. These analyses may further extend understanding of online learning environments.
7.6.2 Learning as agentic positioning (framing)

As demonstrated by this research project, learning environments impact upon student outcomes and student perceptions of the environment. Teachers’ influence on shaping outcomes for students through the framing of the learning environment accounts for and emphasises adults’ abilities and their need to act agentically in facilitating their learning. Understanding the full implication of ‘framing’ on learning requires approaches from both the teacher’s and the student’s understanding. Participatory practices of students are diverse and as such require investigating and elaborating. As elaborated here, teachers use participation and interaction interchangeably and yet student perception appears to view these activities as very distinct. Agentic positioning allows individually constructed understanding of activities to be elaborated within the context of a particular environment and its framing. Investigating agentic positioning, that is the interaction between the intended use of an environment and the enacted use by various agents, requires elaboration of each agent’s perceptions. Focuses for the future include elaboration of teacher purposes for mandating ‘participation’ and the consequences arising from the enactment of those intentions.

7.6.3 Redefining active learning

Vicarious learning and its role in mass produced educational endeavours requires detailed exploration. Hatano and Inagaki (1991) and Sutton (2001) have commenced this process. However, with the realisation that not all students engage similarly through outwardly active learning comes the potential to harness greater diversity of learning resources. There may also be impacts upon the demands of teachers through recognising that participative patterns of students are diverse. Increasing awareness and deeper appreciation of the distinction between outwardly active learners and vicariously active learners is yet to be developed. Future research needs to incorporate this awareness and appreciation towards redefining ‘active learning’ to include those individuals who are ‘vicariously’ active.

7.6.4 Zone of Learning Capability

The zone of learning capability, as a form of active learning – in both outwardly active or vicariously active forms, requires detailed investigation. Vygotsky’s Zone of Proximal Development has provided rich research concerning social learning. However, much of this relates to childhood development although the concept has been
equally applied to adult learners. The Zone of Learning Capability, postulated here, may prove a valuable addition to understanding learning processes, particularly for adult learners. Testing the limits of the Zone of Learning Capability is another area yet to be fully explored. As the zone of learning capability is more descriptive of motivations to learn than ability or development, it appears a more personally agentic view than Vygotsky’s Zone of Proximal Development. Future focuses for research include developing a deeper appreciation of how adults approach learning situations and how this influences the activities in which they engage. Such research will need to be related to agentic positioning and to the redefined understanding of active learning.

7.6.5 Learning with/against technology

The screenface is currently an underdeveloped concept, yet is central to electronically mediated learning. Further research, perhaps best accomplished through a phenomenographic approach with individuals of various skill levels, may provide insights into ways individuals appropriate, master, accept or reject information technology. The screenface represents the individualisation of the interface, at once both transparent and opaque. The screenface and the interfaces to programs are interrelated aspects of computer use. In much the same way that teaching and learning are interrelated activities, the screenface and the interface are interrelated views of computer use. Further focuses include the elaboration of the computer as multi-tool, one that can accomplish many tasks, rather than a simple tool that is used for only one or two tasks. This focuses the research effort on the screenface because this is ‘where’ an individual interacts with the computer. Individually appropriate understanding of technology will likely evolve from these efforts.

These areas provide possibilities for further understanding the dialogical and pedagogic benefits of these and other environments. The contributions of this thesis commence this development of understanding the dialogical and pedagogic properties of online learning environments and contribute to understanding the broader learning needs of individuals within higher education.
8. Appendices
8.1 Email to course coordinator

Hi [coordinator name]

As part of my research for my PhD, I am determining the rates of participation of students in email discussion lists as part of their studies. I am not a member of the list for the unit 84136, and I am aware that becoming a member for the purpose of this research could violate ethical conduct. Would it be possible for you to obtain the number of unique email addresses subscribed to the list and pass this on to me.

This is a simple matter of sending a mailto:majordomo@student.cqu.edu.au with the message "who [course number]" every week of semester. At your request, I will send you a reminder message to facilitate.

My research project is outlined at http://musgrave.cqu.edu.au/~rutha/CV/Research.htm. Please feel free to ask any questions you have concerning my research and I hope the information that I gather is valuable to us both.

Thank you.

Alison
8.2 Example of original email and edited email

8.2.1 Original email – identifying details omitted.

>From 25131-owner  Mon Feb 28 19:34:31 2000
Received: from [server-name] ([server-name] [[server-IP]])
by topaz.cqu.edu.au (8.9.3/8.9.3) with ESMTP id TAA07310
for <[Course number]@[server-name]>; Mon, 28 Feb 2000
19:34:30 +1000 (EST)
Received: from [name] ([IP address])
by [server-name] (8.9.3/8.9.3) with SMTP id TAA15871
for <[Course number]@[server-name]>; Mon, 28 Feb 2000
19:34:28 +1000 (EST)
Message-ID: <001901bf81ce$c985d2e0$db444d8a@[IP address]>
From: "[name]" <[email]@[server-name]>
To: <[course number]@[server-name]>
Subject:
Date: Mon, 28 Feb 2000 19:32:51 +1000
MIME-Version: 1.0
Content-Type: multipart/alternative;
boundary="------=_NextPart_000_0016_01BF8222.9A37A460"
X-Priority: 3
X-MSMail-Priority: Normal
X-Mailer: Microsoft Outlook Express 4.72.3110.1
X-MimeOLE: Produced By Microsoft MimeOLE V4.72.3110.3

This is a multi-part message in MIME format.

------=_NextPart_000_0016_01BF8222.9A37A460
Content-Type: text/plain;
charset="iso-8859-1"
Content-Transfer-Encoding: quoted-printable

I am selling second hand textbooks suitable for 1st year
Business =
students.
I have textbooks, workbooks and study guides for the
following subjects:

[Course number] [Course name] $50
(Text & Study Guide)

[Course number] [Course name] $60
(Text, Study Guide & workbooks)

[Course number] [Course name] $50
(Text & Study Guide)

Prices are negotiable and in excellent condition
Phone [name] on [phone number]
=20
I am selling second hand textbooks suitable for 1st year Business students.

I have textbooks, workbooks and study guides for the following subjects:

<table>
<thead>
<tr>
<th>Course ID</th>
<th>Course Name</th>
<th>Price</th>
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<tbody>
<tr>
<td></td>
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<td>$50</td>
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<tr>
<td></td>
<td></td>
<td>(Text &amp; Study Guide)</td>
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<td></td>
<td></td>
<td>$60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Text, Study Guide &amp; Workbooks)</td>
</tr>
</tbody>
</table>

$50/week for all subjects.
8.2.2 Edited email

>From 25131-owner  Mon Feb 28 19:34:31 2000
From: "Student name" <student@[server name]>
To: <course list@[server name]>
Subject: Date: Mon, 28 Feb 2000 19:32:51 +1000

I am selling second hand textbooks suitable for 1st year Business students.
I have textbooks, workbooks and study guides for the following subjects:

[Course number] [Course name]                      $50
(Text & Study Guide)
[Course number] [Course name]                      $60
(Text, Study Guide & workbooks)
[Course number] [Course name]                      $50
(Text & Study Guide)

Prices are negotiable and in excellent condition
Phone [student name] on [phone number]


8.3 Survey instrument

8.3.1 Initial email

Hi

My name is Alison Ruth from the Faculty of Informatics and Communication. As part of my doctoral research, I am investigating the use of email discussion lists in educational settings. I am currently surveying students enrolled in four (4) units within the faculty who were subscribed to the email discussion list for each unit.

I would like to invite you to participate in this survey about your experiences and opinions of email discussion lists as the faculty uses them. This research is concerned particularly with discussion lists for courses with large enrolments. Your participation is voluntary and important to aiding the understanding of student perceptions of email discussion lists. Your answers to this survey will be confidential, and all responses will be reported only in the aggregate.

As an incentive, I am able to offer participants a chance to win a $100 voucher at a computer store of your choice. There are also minor incentives for each course (4 x $50 vouchers). If you wish to be in the running for an incentive prize, please ensure you enter your name and student identification number. Your name and student ID are required to signify your consent to participate in the survey.

If you DO NOT wish to participate in the survey, please send an email to me stating you do not wish to participate and I will remove your email address from my list of contacts. If you do wish to participate, you need not take any action. I will send the survey to you in a few days. Alternatively, you can complete the survey online at http://www.infocom.cqu.edu.au/Research/Current_Research_Projects/Survey/ (Please remember to enter this email address in the space provided to prevent further reminders.)

Further information about the survey and the research can be gained on the web at http://musgrave.cqu.edu.au/~rutha/cv/research.htm

Thank you for your consideration.

Alison
8.3.2 Survey

Greetings

Would you take a few moments in the next few days and complete this survey about your use of email discussion lists provided by the Faculty of Informatics and Communication. The survey consists of 46 questions, and should take about 15 - 20 minutes to complete.

If you have already replied, please send a message to a.ruth@cqu.edu.au listing all email addresses you use to subscribe to email discussion lists at Central Queensland University. This will ensure their removal from my lists (I do not have names to match with email addresses until after you reply).

At the end of the survey is a space to provide your name and student number. There are two purposes for asking you to supply this. One is to enter your name into the drawer for the incentive vouchers; the second is to ensure you, as a student of CQU, consent to participate. Participation is voluntary, and you are free not to participate. If you do not wish to participate, simply email me stating you want to be removed from the survey list. If you find any questions uncomfortable to answer, please leave that question blank.

Your answers to this survey will be confidential, and all responses will be reported only in the aggregate. Each email will be saved as a text file on a removable storage device. Upon receipt, your email address will be removed from future reminder contact lists. Any copies of your email will only be saved with your email address and consent stripped from the file. The original email will be deleted from the server (musgrave) and my personal computer.

Ethical clearance has been granted from the Human Ethics Research Review Panel. If you have any concerns, please contact me by one of the methods listed at the end of this email or my Research Supervisor, Associate Professor Evelyn Hovenga.

If you are not yet eighteen years old, please request your parent/guardian to contact me to provide their consent.

Please email the survey back to me (a.ruth@cqu.edu.au). With most email programs, you can respond simply by using the reply command (in Eudora - under the message Menu, in Outlook - under the Action Menu, or using the reply button) and then typing in your responses where indicated.

Alternatively, you can complete the survey online at http://www.infocom.cqu.edu.au/Research/Current_Research_Projects/Survey/ (Please remember to enter all email addresses in the space provided to prevent further reminders.)

If you would prefer, you may print the survey and mail your responses to:

Reply Paid 195
Alison Ruth
Bundaberg CQU
Section 1. About You

1. Enrolment status
   a) Full time
   b) Part time

   YOUR RESPONSE

2. Age

   YOUR RESPONSE

3. Sex
   a) Female
   b) Male

   YOUR RESPONSE

4. Enrolment Mode
   a) External
   b) Internal

   YOUR RESPONSE

5. Campus (if internal)
   a) Brisbane
   b) Bundaberg
   c) Emerald
   d) Fiji
   e) Gladstone
   f) Hong Kong
   h) Mackay
   i) Melbourne
   j) Rockhampton
   k) Singapore
   l) Sydney

   YOUR RESPONSE

6. Course enrolled in
   a) Information systems
   b) Multimedia studies
   c) Information Technology
   d) Informatics
Appendices

e) Other (please state)

YOUR RESPONSE

7. Number of years already enrolled in this course

YOUR RESPONSE

8. Access to computers
   a) University only
   b) Home only
   c) Friend's computer
   d) Both at university and at home
   e) Work
   f) Other (Please state)

YOUR RESPONSE

9. How many email addresses do you have?

YOUR RESPONSE

10. Which email addresses do you use for your studies?

YOUR RESPONSE

11. Postcode of home address

YOUR RESPONSE

12. Postcode of term address (if different)

YOUR RESPONSE

13. Occupation (if employed)

YOUR RESPONSE

Section 2 About Email Discussion Lists.
For the following questions, answer for those units in which you were enrolled during Autumn Term, 2000 (that is February to June, this year).

14. For how many weeks of the semester were you subscribed?

YOUR RESPONSE [course id]
YOUR RESPONSE [course id]
YOUR RESPONSE [course id]
YOUR RESPONSE [course id]
15. How often did you read messages on the list?
   a) Several times a day
   b) Daily
   c) Several times a week
   d) Weekly
   e) Monthly
   f) Occasionally
   g) Once or twice

   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]

16. Did you post any messages to the list?

   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]

17. If yes, how often?
   a) Several times a day
   b) Daily
   c) Several times a week
   d) Weekly
   e) Monthly
   f) Occasionally
   g) Once or twice

   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]
   YOUR RESPONSE [course id]

18. What types of posts did you make to the list? (List as many as needed.)
   a) Ask a question
   b) Answer a question
   c) Make a comment
   d) Organise a study group
   e) Other (Please list)

   YOUR RESPONSE

19. Did you receive replies to your posts?

   YOUR RESPONSE

20. Were these replies useful to you?

   YOUR RESPONSE
21. How would you describe email discussion lists to fellow students?

YOUR RESPONSE

22. What are the most valuable aspects of email discussion lists?

YOUR RESPONSE

23. What are the least valuable aspects of email discussion lists?

YOUR RESPONSE

24. Are you involved in more than 1 (one) email discussion list for your studies?

YOUR RESPONSE

25. In what ways do these discussion lists differ?

YOUR RESPONSE

26. Do you feel a part of a 'community' of students who use email discussion lists?

YOUR RESPONSE

27. In your opinion, can the use of email discussion lists be improved?

YOUR RESPONSE

28. In what ways?

YOUR RESPONSE

29. Do you have any examples of innovative use of email for learning?

YOUR RESPONSE

30. What do you expect from participation in an email discussion list?

YOUR RESPONSE


Section 3 About your skills and feelings
For the following questions please use the following scale - 1 for strongly agreeing with the statement, and 5 for strongly disagreeing.

1  Strongly agree
2  Agree
3  Undecided
Appendices

4  Disagree
5  Strongly Disagree

Example    I look forward to getting your completed survey in my email.
            MY RESPONSE (1-5) 1

31.           I look forward to expressing myself at meetings.

YOUR RESPONSE (1-5)

32.           I am afraid to express myself in a group.

YOUR RESPONSE (1-5)

33.           I look forward to an opportunity to speak in public.

YOUR RESPONSE (1-5)

34.           Although I talk fluently with friends, I am at a loss for words on the platform.

YOUR RESPONSE (1-5)

35.           I always avoid speaking in public if possible.

YOUR RESPONSE (1-5)

36.           I feel that I am more fluent when talking to people than most other people are.

YOUR RESPONSE (1-5)

37.           I like to get involved in group discussion.

YOUR RESPONSE (1-5)

38.           I dislike to use my body and voice expressively.

YOUR RESPONSE (1-5)

39.           I'm afraid to speak up in conversations.

YOUR RESPONSE (1-5)

40.           I would enjoy presenting a speech on a local television show.

YOUR RESPONSE (1-5)

41.           I enjoy sending emails to friends.

YOUR RESPONSE (1-5)
42. I enjoy reading emails from friends.

YOUR RESPONSE (1-5)

43. I dislike reading emails from the email discussion lists.

YOUR RESPONSE (1-5)

44. I would encourage fellow students to use email discussion lists.

YOUR RESPONSE (1-5)

45. Email discussion lists are very important to my studies.

YOUR RESPONSE (1-5)

46. Do you have any other comments?

YOUR RESPONSE

Please list all email addresses you have used to subscribe to discussion lists at Central Queensland University.

Agreement to participate in survey
I INSERT NAME have read the information above and agree to supply answers to the survey questions. I understand that my name will not be stored with my responses to the above questions. I agree that the research data gathered for this study may be published provided my name or other identifying information are not used. I am providing my student identification number INSERT STUDENT ID in place of my signature.

Thank you for completing this survey. Please return this survey within seven days of the receiving it. If you any other comments or any questions, please include them here.

Once again, Thank you . . . I really appreciate your help.

Alison Ruth
8.3.3 Reminder email

Greetings again

During the mid-semester break, a questionnaire seeking your opinions about email discussion lists was emailed to you. As I have not yet received a reply from you concerning this survey, I would like to take this opportunity to let you know that I will continue accepting completed surveys until the end of November. This should allow you to complete your assessment and then reply to the survey.

If you DO NOT wish to participate in the survey, please respond to this message stating you wish to be removed from the contact list by inserting "PLEASE REMOVE" in the subject heading.

If you would like to complete the survey at a later date, please do so. Your response is important to accurately represent the opinions of students participating in email discussion lists with the Faculty of Informatics and Communication.

You may access the survey on the web at http://www.infocom.cqu.edu.au/Research/Current_Research_Projects/Survey/. If you require, please respond with a request for a copy of the survey and I will resend the email version.

Thank you. I really appreciate your help.

Alison
8.3.4 Final reminder

Greetings

Congratulations on completing another semester of study. Now that your exams are over, you may remember the survey that I sent to you during the mid semester break. Hopefully, you will now have time to complete this for a chance to win $100 voucher from a computer store of your choice.

The survey can be filled out on the web at http://www.infocom.cqu.edu.au/Research/Current_Research_Projects/Survey/ or you can reply using the version below. Don't forget to fill in the agreement to participate at the end. I need your name and student ID for your response to be valid (and to let you know if you win).

Thank you for your time and good luck in your future studies.

Alison Ruth

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
8.4 Ethical Clearance Documentation

HUMAN ETHICS RESEARCH REVIEW PANEL
CERTIFICATION STATEMENT

The Human Ethics Research Review Panel is an approved institutional ethics committee constituted in accord with guidelines formulated by the National Health and Medical Research Council (NHMRC) and governed by policies and procedures consistent with principles as contained in publications such as the joint Australian Vice-Chancellors’ Committee and NHMRC Statement and Guidelines on Research Practice.

The Panel has considered the project described in a Request for Ethical Clearance and as detailed in this Statement, is pleased to grant ethical clearance for the nominated period of certification.

<table>
<thead>
<tr>
<th>First-Named Principal Researcher:</th>
<th>Ruth, Ms A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title:</td>
<td>Teaching, Learning and Communication in Information Technology Education</td>
</tr>
<tr>
<td>Clearance Number:</td>
<td>00/1-13</td>
</tr>
<tr>
<td>Period of Certification (see note below):</td>
<td>29 March 2000 to 1 December 2001</td>
</tr>
</tbody>
</table>

NOTES:

(1) This statement remains current for the period of certification on the condition that the research techniques and procedures as described in the approved Request for Ethical Clearance and attendant documentation remain unchanged. Any revisions or amendments must be brought to the attention of the Panel which will determine whether ethical clearance should continue.

(2) A further Request for Ethical Clearance must be considered and approved by the Panel in order for the project to continue after the end-date noted above. Where research is conducted without a current certification statement, an investigator will be in breach of the University’s Code of Conduct for Research and the subject of allegations of research misconduct.

Associate Professor Robert Ho
Chair, Human Ethics Research Review Panel
Date: 29 March 2000

Any written information provided to a participant or subject must contain the statement, "Please contact Central Queensland University’s Research Services Office (tel 07 4923 2607) should there be any concerns about the nature and/or conduct of this research project.”
8.5 Functions of messages

Questioning

Questioning Assessment

do we have to show our working in the assignment, thanks

Questioning content

I am having a great deal of difficulty understanding MAX & MIN from the example on P.67 Edmonds.

have read it many times, stepping through the process - sometimes i think I understand it, but i can't seem to work out the assignment question without referring directly to the page - which means I don't really understand what i am doing - would appreciate another way of saying the same thing or perhaps a point in the direction of extra reading that might clarify it - have searched the web but found only one mention of 'set comprehension' and that was no help.

how do i/we insert SQL " Group by " 's and/or " Order by " 's into relational calculus?

or can u tell me where in the hell it says in the @#$ :-) texts how do do that

:-) any reply will be greatly appreciated

Hi all, I'm having some trouble with question 2B(ii). Im not sure how to write the GroupBy and Having statements within this question using relational calculus.

Questioning list

My email to the list hasn't been posted back to my mailer.

Does the majordomo only send it to somebody else??

Questioning networking

Is there anybody out there interested in forming a Brisbane study group for this subject. If so drop me a line and we
will see what we can do.

**Questioning non-content**

Can nel tell me if you can delete the files in C:\WINDOWS\TEMP without stuffing up your computer??

**Questioning study**

Do you have to have a complete understanding of relational calculus by week 2? Where can i find more info besides the distance resource materials book?

**Questioning clarification**

I am not sure what you mean?

**Responding**

**Responding assessment**

the algorithm for assignment 1 is found in week2 labs on our website.

It is necesary for you to copy and paste the text version of the algorithm into a text editor (eg notepad) and then save it with the extension pcf..eg assign1pcf (you may need to remove a txt extension) it can then be run in vpc easily..this has been replicated in internal labs without any hitches.

**Responding assistance**

It is very hard question to answer. You could send me your code personally with the things that you have tried and the errors that you get and I will see what I can do.

**Responding list**

When you use e-mail (or IRC etc..) the verbal queues and facial expression we use in general conversation are missing, and often the people receiving the message misinterpret it's content as aggressive or angry when no such emotion is meant. So it is customary to use written
quest (like <grin> or -:) ) to help signal that you are not angry or attacking the receiver but in fact quite happy and joking. It just lighten everything up and helps reduce misunderstandings.

**Responding tips**

The easy way to check your answers is to open up the Windows calculator (provided you use Windows), switch to 'scientific' mode and enter your answer. Then, via the 'dec' 'oct' 'hex' and 'bin' radio buttons in it you can convert the number to whatever you wish.

**Responding networking**

Yes - you're not on your own. I'm finding the programming much harder this semester. Programming B was supposed to be hard, but that was fine compared to this one. Most of the time I feel I am struggling with so much information and also I find the exercises each week extremely hard, and only manage to complete a couple, if that - seems to take me a very long time.

Just wanted to let you know there are others (well me anyway) having trouble.

**Responding study**

I think we don't need to print out that lecture slide because The materials in lecture slides and our study guide is much similar. please check once.

**Responding tips**

Another good practice is to write some test programs to enhance your understanding, it will give you confidence that what you are doing is correct <grin>.
9. References


Bakhtin, M. M. (1986) *Speech genres and other late essays*, University of Texas Press, Austin.


References

pp 133-169.


References


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Inglis, A. (1999) Is online delivery less costly than print and is it meaningful to ask?, *Distance Education, 20*:2, pp 220-239.


Piburn, M. D. and Middleton, J. A. (1998) Patterns of Faculty and Student Conversation in Listserv and Traditional Journals in a Program for Preservice Mathematics and
References


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References


