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Reflecting on the Need to Evaluate Courses Using ICT within a Pedagogical Framework

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Abstract

In the rush by academics to incorporate online learning technologies into tertiary education courses, pedagogical imperatives are often ignored. This paper addresses the need to step back and evaluate courses holistically within a structured framework that allows for the determination of appropriateness of use of one or more technologies. This paper attempts to add to the body of knowledge on successful and appropriate integration of technology into courses by investigating how email technology can support learning. It uses Reeves' fourteen dimensions of pedagogy for computer based learning to evaluate a course that uses email as the principle communication tool for teams of distance education and internal students. The outcomes of the evaluation indicated that use of a technology can be supportive of learning needs if used appropriately.

Keywords

Computer-Based Communication Systems, Educational Technology, Epistemology, Information Technology Adoption, IS Curriculum, IS Education

INTRODUCTION

The body of literature related to online learning environments is rapidly growing, yet much of it is polarised. A significant amount is still based on personal preferences or opinions that reflect the researcher's perception of the value of the technology (Lane and Shelton, 2001; Roberts, 2002), becoming what Weiner (1990) calls 'conviction' research. Other researchers base their conclusions on studies consisting of self-selecting groups of students (Hara and Kling, 2000), which, while allowing an understanding to develop, do not address the issue of why other students choose not to participate. In reality, students are often required to engage with online learning environments based on preconceived ideas that are not necessarily grounded on sound pedagogical principles, but a desire by instructors to use the technology simply because it is available (LaMaster, Williams and Knop, 1998; Lane and Shelton, 2001). The authors are acknowledging that technology is here to stay, and that it offers another strategy to be considered in determining teaching, learning and delivery options for courses based on pedagogical imperatives. It can be argued, that in the broadest sense of the term, technology has always been an integral component of education – from cave walls to virtual caves. Yet "little knowledge has been generated about how to design an innovation to facilitate learning of a particular desired outcome by a particular group of learners in a particular context" (Driscol and Dick, 1999:15).

This paper attempts to add to the body of knowledge on successful and appropriate integration of technology into courses by investigating how email technology can support learning. As O'Hagan (1995) points out, what matters most in distance learning, and indeed all learning, is the promotion of "reflective, inner interaction". The course 'Analysis and Specification' offered by the Faculty of Informatics and Communication, Central Queensland University in the Information Systems (IS) and Information Technology (IT) programs will be used as the basis for the discussion. The principle form of communication between individuals and teams in this course is through the use of email. A brief overview of the course is provided, followed by an evaluation of the course based on the pedagogical dimensions identified by Reeves (1997) for evaluating computer-based education.

ANALYSIS AND SPECIFICATION – A BRIEF OVERVIEW

This is an advanced level course that builds on the introductory course Systems Analysis and Design, which is a core first year course for both IS and IT students. Typically students would enrol in Analysis and Specification in their second year of full-time study or equivalent if studying in distance mode. The course provides students with more depth and breadth in the concepts and skills associated with the analysis and specification phase of the software development process for large complex systems based on software engineering principles.

The student cohort typically consists of a mix of mature-age students, some of whom are already working within the IT/ IS industry, and those who moved directly from high school to university. Atypically for many IT programs, there is a reasonably even gender balance. Thus there is a significant range of backgrounds and experiences that are brought to the course. In the Autumn 2001 (first offering) and 2002 terms, the student cohort consisted of approximately 120 internal (Mackay, Rockhampton, Gladstone and Bundaberg campuses) and distance education students.

The normal output or deliverable of the analysis and specification phase of the software development process is a software requirements document (SRD). In industry this deliverable is developed by a team of people quite frequently working in different geographical locations and using various communication technologies to support developmental activities. Email is often used in these circumstances as the principle communication tool amongst team members. To simulate this type of working environment, students in the course are expected to work in teams using email as a communication tool to produce a substantive software requirements document as the final product for assessment. The document details the specifications for a new software system based on an analysis of the case study provided to students. Document components include requirements definitions and specifications written in a very specific genre, data flow diagrams and entity relationship diagrams modelling the new system, system evolution identifying anticipated system changes in the near future, data dictionary, system architecture, glossary and so on. A significant number of distinct skills are required to competently complete the document. Using email has a number of advantages including distance education students can actively participate and interact with other students as members of a team; a more complex and realistic project can be assigned as the basis for assessment; closer approximation to a realistic work environment is enabled; and students develop additional professional attributes that would not be possible through individual work.

STUDENT USE OF EMAIL

IS and IT students are expected to have on-going access to a computer and an Internet account. An email account is automatically created for every enrolled student. The fact that students will have an email account allows teams to be created and work on a project irrespective of the geographical location of students. In addition to individual email accounts, a course email list is established. Students are expected to be familiar with the basics of email use since this is taught in introductory level courses. The Analysis and Specification email list is used for the submission of weekly activities by teams for critique by other students, and for questions and general discussion. Additionally the course website contains information on the course, including the course profile, lecture slides, weekly activities, assessment requirements and so on, that students can access and download.

There are three distinct ways in which students use email – private, general discussion and team emails. Each type of email has specific purposes. Private email is intended for interactions between the student and the instructor for problems of a more personal nature and is used rarely. General discussion occurs within the class list. Every team must contribute a ‘weekly requirement’ aligned to the document they are expected to create. For example, one of the weekly requirements is construction of an entity relationship diagram for the new software system. The resultant diagram is then emailed to the class list. As stated above, it is expected that other students will provide a critique of these submissions. The instructor adds to the discussions and critiques which provides immediate feedback that teams can use to make appropriate revisions – in a sense providing formative assessment and opportunities for reflective interaction. The class list also includes questions by the

instructor to stimulate reflective discussion. This is pivotal to integrating internally enrolled and distance students into the course content. Team lists are created by the teams for discussion for intra-team communication and for working collaboratively on the software requirements document. This paper focuses on the class list.

REEVES EVALUATION FRAMEWORK

Much of the published material dealing with online learning provides justification for what people are using – a kind of "that's cool technology, let's use it" (Lane and Shelton, 2001:242) and implies 'gee it let's me get away from the classroom' (Roberts, 2002) attitude. The lack of a theoretical framework in this literature results in what Bridges (1998) calls "a fascinating clash of epistemologies" where thinking about 'knowing' disappears within attempts to define a 'comfort zone of teaching'. This comfort zone reflects what McWilliam (1997) believes is an attempt to do away with the teacher's body, relieving the need to 'perform' in a class and placing the academic in a kind of 'student free space'.

Reeves (1997) describes a framework for evaluating computer based learning resources which is readily adapted to online learning environments. Figure 1 (described later) lists the fourteen dimensions of pedagogy identified by Reeves. The dimensions are epistemology, pedagogical philosophy, underlying psychology, goal orientation, experiential validity, teacher role, flexibility, value of errors, origin of motivation, accommodation of individual differences, learner control, user activity, cooperative learning, and cultural sensitivity (Reeves, 1997). These dimensions are not binary oppositions but represent pedagogical perspectives. As this paper is evaluating how students are using an email discussion list as a component of the learning experience and environment, the dimensions will be used to inform our understanding of online environments.

The diversity and complexity of higher education, to which we have added online learning environments, cannot be encompassed by any one discipline or disciplinary subfield (Meek, 1997). Understanding the totality of education and undertaking a thorough and comprehensive evaluation becomes difficult when instructors view the online environment from within their own epistemological and pedagogical assumptions. As we have been using and developing online environments for many years now, we need to step back in some ways and address the issue from a new perspective, a broader perspective, to evaluate what we are doing. Reeves' Pedagogical Dimensions enable this analysis. The following discussion of pedagogical dimensions is taken primarily from Reeves (1997) with clarification from others as necessary.

Applying the Dimensions

As 'epistemology' deals with the nature of knowledge (Abell and Eichinger, 1998; Schon, 1995), the presentation of content in an online course, as well as any other course, can range from an objectivist position to a constructivist position. Content presented from a totally objectivist frame allows for little, if any, interaction as all the knowledge required would be available. Knowledge in this view is immutable and 'transmitted' to the student. Web-based lecture notes embrace an objectivist epistemology. Content presented in a constructivist framework, however, allows for individuals to 'construct' their knowledge based on prior experience, new information and social dialogue. Thus, learning environments that allow for interaction, particularly between individuals, tend to be based on a constructivist epistemology. Objectivist epistemologies tend to allow for little, if any, interaction, while constructivist epistemologies are centred on interaction — between participants, between participants and the instructor and between the participants and the material.

The epistemology, of the course Analysis and Specification, tends toward a constructivist position. Interaction is a central facet of this course, as students are required to post messages to the course list, showing their progress toward their final product. The production of the software requirements document requires interaction not only of students with learning materials, but students within each team, students within the course, students as a team with the instructor, and students as individuals with the instructor. This constructivist epistemological framework is inherent in the design of the course. The large number of messages sent to the list by the instructor and students, and the extensive

conversations sustained by participants, all point to a general atmosphere of learning through social dialogue.

The 'pedagogical philosophy' of a course refers to the approaches to teaching and learning, which range from instructivist to constructivist. Instructivist approaches are based on goals and objectives that 'exist apart from the learner' while constructivist approaches to learning rely on the learners' intentions and experience. Where there is little recourse to discuss the course material, the objectives are posited as apart from the learner. Where discussion is central to the fulfilment of course requirements, students are 'actively' engaged in learning (Feenberg, 1989) and instructors are able to gain insight into the learners' intentions and experiences. The activities and encouragements found in messages within the course discussion list are all indications of constructivist pedagogy.

The 'underlying psychology' of a learning environment concerns assumptions about the actions of the individual student. While not all psychological models of learning are incorporated, a basic dichotomy is postulated by Reeves (1997) between behavioural and cognitive theories. Behavioural theories measure learning through observations of the behaviour of students while cognitive theories attempt to gain understanding of the internal mental states of individuals. Assumptions can be made about the intent of students from the email messages. Although these assumptions are based on observations of the behaviour of students, an attempt to gain an understanding of the thinking, the internal processes, of the student can be made through content analysis of email messages. Consequently, the underlying psychology of the course list in general terms appears to be behavioural as student participation through sending and reading messages is in essence a behaviour, however the content of the messages often exhibits examples of reflection and other cognitive functions.

'Goal orientation' ranges from sharply focused to unfocused. Sharply focused goals allow the precise knowledge (for instance programming structure and language) to be elucidated while unfocused goals allow more general knowledge and goals (for example determine which standards to apply). The goal orientation of the course, and consequently the list, is sharply focused, that focus being the achievement of the learning objectives of the course, specifically the production of a software requirements document that adheres to very specific standards. However this focus needs to be extracted and applied from abstract generic concepts and goals that can be applied in a diverse range of situations.

'Experiential validity' relates to the context of learning. For instance, abstract knowledge is generally presented in lectures and is often decontextualised from 'real world' applications. In contrast, concrete knowledge is found in apprenticeship learning where interactions with an expert are part of the learning process. Learning within tertiary environments is often closely related to the purpose of qualifying for a profession (Snoke and Underwood, 2000). In this respect, the experiential validity of most courses is comparatively concrete, particularly within skills based courses. This is highlighted within the Analysis and Specification course as some students work within the industry and on occasion bring discussions of their work to the list. Notwithstanding this concrete aspect of the course, the list tends toward abstraction due to the nature of the questions and problems that are addressed to the list. More simply, these questions are often related to a small part of an overall problem the student is addressing within their learning, 'abstracted' from the whole picture that is an assignment or other learning activity. Experiential validity also exists in the course in that students need to contextualise abstract concepts presented in the lectures and apply them concretely in the project.

Traditional didactic teaching is based on the exposition of information such as found in many lectures where the instructor expounds on the theory of a topic. Conversely, when the teacher takes the 'role' of facilitator, students and teacher become co-learners with the teacher often learning along with the student. The role of facilitator, as postulated by Reeves (1997), ranged from didactic instruction to facilitative teaching. Didactic instruction appears to offer little in the way of interaction, with the instructor in the role of expert whose knowledge is unquestioned. Examples of didactic instruction abound in face-to-face scenarios where an individual instructor reads directly from notes and allows very few questions if any. Course email list discussions indicate that a facilitative style is employed. Additionally, questions are actively encouraged and solicited.

Program 'flexibility' relates to how much a teacher can influence the activities. Teacher-proof courses maintain their objectives regardless of the individual teacher. Easily modifiable programs allow teachers to change aspects of the course to suit their own style and, at times, the styles of their students. Program flexibility impacts very little on the operation of some courses, although where there is room for flexibility, the availability of an interaction medium would appear to provide further scope for individual instructors to build in ways in which both their style of teaching and their students' learning styles can be accommodated. Email discussion lists can provide for greater flexibility which, when encouraged by the instructor, allow students to contextualise knowledge and pursue topics in novel ways. Program flexibility refers mostly to the design and structure of the course. This course is well structured which allows the students to achieve the desired outcomes. The flexibility within this course refers more to the flexibility written into the course for students. As a course, there is minimal room for teacher modification as the structure is well defined and easily applied. However, there is inherent flexibility that can accommodate an instructor's preferred teaching and delivery style and students' learning styles.

The old adage, 'learning from our mistakes' underlies the 'value of errors' dimension. While most learning situations allow for some errors, some computer based learning programs can be programmed to accept only correct answers (for instance by disabling all incorrect keys when a response is required). The value of errors in learning is greatly enhanced in situations where instructors are comfortable with admitting their own. In attempting to concretely apply abstract concepts in the context of the project, students often make mistakes. This is, in fact, an inherent component of the course. Students are unlikely to be able to continuously apply new skills to weekly activities without error. Feedback, comments and questions on the email list from both students and instructor allow the students to take progressive corrective measures, and by doing so, gain a greater understanding of the concepts and experience in the required skills.

Intrinsic 'motivation' of students has always been a highly regarded aspect of learning. However, motivation of students becomes problematic at some time in the learning process. Students often question the value of learning particular information (particularly in mathematics) and require extrinsic motivation (often based on contextualisation of the value of specific knowledge). While much learning is either intrinsically or extrinsically motivated, use of email discussion lists tends to be due predominantly to intrinsic motivation on the part of the student. Previous studies where participation is mandated appear to be relying on extrinsic motivation that results in findings indicating no discernable intellectual activity in messages (Rada and Henderson, 1998). These findings are not confirmed in this course. Subscription and submission to the email list are compulsory, but email messages clearly demonstrate 'intellectual activity'. This is predominately due to the structured nature of the course mentioned above. For students, there is a clear benefit to participation outside of gaining a mark. The list provides them with an opportunity to view how other teams are dealing with the skills and concepts associated with the course through weekly submissions of activities.

Individual 'differences' in learning can be profound and often require teachers to interact one-on-one with students having particular problems. Homogeneity of student abilities is the underlying assumption of non-existent accommodation of individual differences, a situation that rarely, if ever, occurs in a learning environment. However, as Reeves (1997) points out, many computer based learning programs allow little room, if any, for differences in individual learners. Learner differences become extremely apparent however in interactive environments with the range of questions asked by students. Analysis and Specification inherently allows for accommodation of learner differences. Students have access to a variety of materials as well as the email list. Where it is evident that one or more students are experiencing difficulty understanding a concept, alternative explanatory methods are provided. The email list is invaluable in allowing the instructor to identify when this additional support is required, particularly for distance education students who may otherwise engage in limited interaction with the teacher and/ or other students.

'Learner control' allows for individuals to select the knowledge required for learning. Learner control within tertiary study, particularly bachelors degree programs, is very limited. Lack of learner control can be extended to lists, as students cannot control the rate of flow of

information from the lists. Learner control of lists is very limited although they generally have full control over their subscription and participation. However, online learning environments enable access to web-based materials that provide information that is often more current and can offer alternative explanations of concepts and more in-depth information on topics of interest to individual students. This facility offers some learner control in the selection of knowledge required for learning. Students in Analysis and Specification are encouraged to make use of web-based materials to inform their learning.

'User activity' relates to the ability of the learning environment to allow for student representation of knowledge. 'Mathemagenic environments' (Hannafin, 1992) allow learners to access previously represented knowledge while generative environments allow students to make connections creating, elaborating and representing knowledge. The user activity level within email discussion lists allows for students to utilise them in 'generative' ways (Hannafin, 1992). Students are able to represent their knowledge and their problems in various ways as they progress through the material. Within Analysis and Specification, user activity is facilitated in a number of ways – student submissions of activities allow the variety of approaches to problem-solving to be shared, discussed and elaborated; additional resources are often posted for sharing with other students; questions on problems encountered with concepts, modelling and materials are presented for comment, discussion and feedback. The instructor provides feedback within a very short time frame, often posing questions that allow students to resolve these issues rather than providing specific answers immediately.

Cooperative learning is based on the ability of small groups to accomplish shared goals (Slavin, 1992). Cooperative situations, according to De Lisi (1999), are characterised by mutual respect, rather than unilateral authority. Opportunities for cooperative learning can be built into discussions and other activities undertaken by students. A form of cooperative learning is integral to the functioning of email discussion lists as interaction is central to this dimension (Slavin, 1992). The cooperation is general, rather than specific as is the case in most examples of cooperative learning. Cooperative learning, in the broadest definition, can include the discussion of all aspects of a course. The nature of the environment of email lists as collaborative is facilitated by a commitment to participate that is displayed by the instructors. Collaborative learning through teamwork and information sharing is central to Analysis and Specification.

'Culturally sensitive' environments are often hard to define, as each situation requires attention to the cultural context of both the material and the setting. The cultural background of students also needs to be considered. While email discussion lists are not specifically culturally insensitive, instances occur where language problems arise. However these are not always related to cultural differences, as misspellings by presumed English-speakers are more likely to elicit comments from participants than attempts at correct English by apparent non-English speakers. In this way, the cultural sensitivity of lists is heavily dependant on the cultural sensitivity of the participants and as groups become more culturally diverse, these language problems become less important than the concepts contained in the messages. The posting to the email list demonstrated a surprisingly high level of cultural sensitivity in a number of ways. Emails were invariably courteous, used appropriate language and maintained focus on issues relevant to the course. Critiques and comments on the work of other students framed questions that addressed the submission and not the person.

EVALUATION OUTCOMES

Reeves' pedagogical dimensions evaluate the pedagogy of a course in terms of how its design and implementation affects learners (Reeves, 1997). "Pedagogical dimensions are the keys to unlocking the black-boxes of various forms of CBE [Computer Based Education]" (Reeves, 1997). For this purpose, the content of the course is largely irrelevant as the framework can be applied to any course. The core content of a course is determined and evaluated using other criteria and methods. What is relevant is whether the use of a particular technology or technologies supports the implementation and delivery of a course in terms of intended student learning experiences and outcomes. While use of a technology does not and should not impact on content, it can affect the types of assessment implemented, activities provided and content structure.

Figure 1 shows the mapping of evaluation outcomes for the Analysis and Specification course.

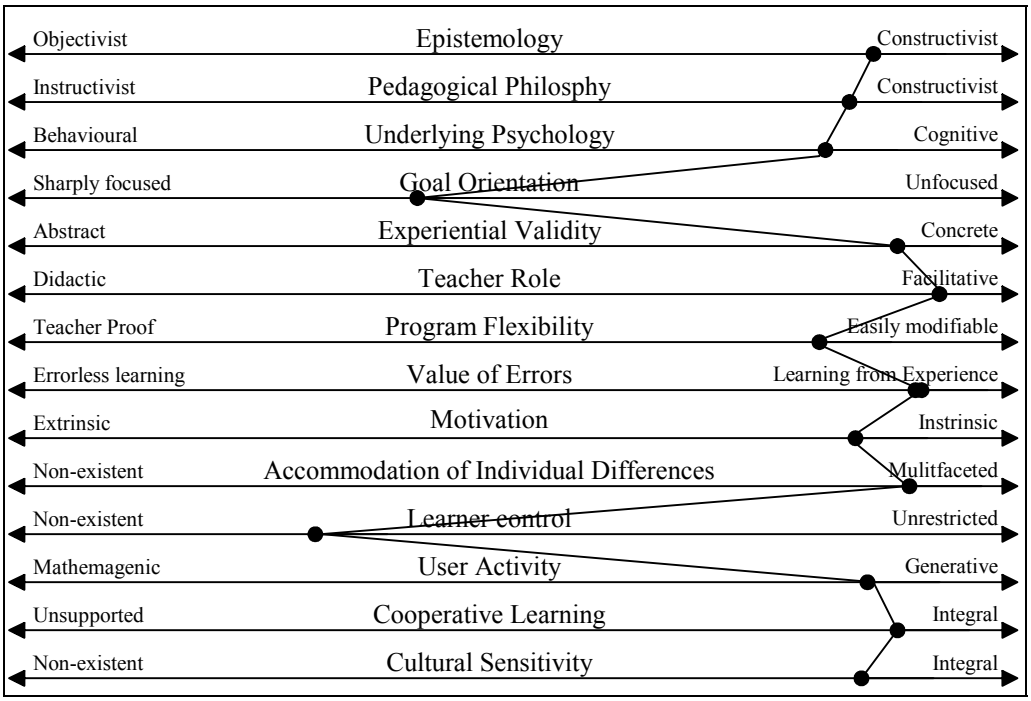

Figure 1: Mapping of evaluation outcomes incorporating email use for the course Analysis and Specification

The majority of dimensions support the notion of a constructivist environment. Goal orientation is sharply focussed and learner control is almost non-existent indicating that attention is required to these dimensions. However, external factors such as accreditation and time constraints can place limits on what is achievable, particularly for the two dimensions of learner control and goal orientation.

The use of email technology supported course delivery and intended student learning outcomes in a number of significant ways. Email allowed the formation of teams that were inclusive of both internal and external students. All students were engaged in the same processes of collaborative and cooperative learning, teamwork, interpersonal skills, communication skills and participation in an environment that simulates a real world application. These are all major objectives of the course, but without the availability of an easy to use technology, as is the case with email, this learning experience would not have been achievable, particularly for distance education students. Thus all students were afforded the same opportunity for achievement of the intended learning outcomes in a student centred approach. In this case, the technology enabled pedagogical objectives in the experiential, user activity and cooperative learning dimensions.

Another major objective was to make the learning of a number of complex concepts and skills more manageable for students by having very focussed weekly activities that deal with only one or two major concepts. Students then applied these concepts concretely in the weekly activity, which was submitted to the email list in the following week for feedback and discussion. For example, one of the weekly activities deals with identifying software requirements and writing them in a very specific style. Most students do not find this style of writing very intuitive and require practice to attain proficiency. Students also need practice in identifying not just software requirements that are self-evident in the case study, but those that have not been stated and need to be elicited. This activity requires higher-level cognitive skills. Without the use of email technology, this objective would have been almost impossible to achieve for all students. Email supported immediacy of feedback that enhanced the 'value of errors' and 'teacher role' dimensions. Students could take appropriate corrective measures in a timely manner based on feedback provided by the instructor and other students on the email discussion list.

One of the important objectives of the course is the development of the skill of reflective practice. The exposure to weekly activity submissions by other teams supported the development of this skill. In reflecting on the various solutions submitted, students also engaged in reflecting on their own solution in a number of ways, for example, its appropriateness. Again, without the use of email technology, this would not have been possible for all students and the objective would have been very difficult to achieve, particularly for distance education students.

There are a number of statements that can be made following the evaluation of this course. These include that:

- This particular course allows students to engage in the 'reflective inner interaction' mentioned previously;
- The email discussion list and the use of email to support teamwork is appropriate as it is supports student learning experiences and outcomes;
- Technology, specifically the discussion list, does enable distance education students to become actively involved in the learning process and engage with members of their team and other students in the course;
- Instructors' epistemology can be matched to course delivery as shown in this instance and can be applied to other epistemological positions; and
- Providing well-structured activities in conjunction with technological innovation can facilitate learning and interaction between students and contribute to the successful achievement of course objectives.

CONCLUSION

Courses are in some ways always subjected to some kind of evaluation process. Generally this evaluation has been done in terms of accreditation; content appropriate and applicable to the level of the course; appropriate assessment; attrition rates; and results (grades) achieved by students. However, rather than focusing on how technology impacts upon these issues, we should focus on the course and content and, in this process of re-focussing, determine which technology or technologies are appropriate to delivery and students' learning needs.

Courses need to be evaluated on more than accreditation and content. It is important to evaluate how the use of technology supports learning for students and whether one or more technologies are appropriate in the presentation of courses. If we are evaluating a course in this more holistic way, we are actually evaluating it from a student-centred perspective.

Rhetoric in most of the literature pays lip service to the concept of student centred learning experiences. Focus on student centred learning is unlikely to be accomplished with more commonly used methods of course evaluation. Reeves' Pedagogical Dimensions (1997) framework offers a more holistic approach to course evaluation. By forcing reflection on learning environments and learning experiences from a student perspective as well as issues such as instructor epistemology, a more appropriate match of delivery, presentation and sequencing can be undertaken.

The process of evaluating courses can assist an instructor to understand the education process more completely as well as generate an increased awareness of preferred teaching and interaction styles of students. Evaluation of courses takes on a new meaning and more complete process using this framework.

The pedagogical dimensions outlined by Reeves (1997) are applicable in most instances to evaluating online learning environments. As demonstrated here, using the course Analysis and Specification, the framework provides insight into the operation of courses. Use of an inclusive framework allows reflection on course development and administration. This reflection is essential in education to maintain relevance of study for students. While many academics would like to use the technology to escape the classroom, this paper shows that we cannot really 'get away from the classroom' as the classroom and the instructor are 'virtually' tied to the computer.

REFERENCES

Abell, S. K. and D. C. Eichinger (1998). Examining the Epistemological and Ontological Underpinnings in Science Education: An Introduction. *Journal of Research in Science Teaching* 35(2): 107-109.

Bridges, D. (1998). The construction and organisation of knowledge in the university curriculum. *British Educational Research Association Annual Conference*, Belfast.

De Lisi, R. and S. L. Golbeck (1999). "Implications of Piagetian Theory for Peer Learning". *Cognitive Perspectives on Peer Learning*. A. M. O'Donnell and A. King. London, Lawrence Erlbaum Associates.

Driscol, M. and W. Dick (1999). New Research Paradigms in Instructional Technology: An Inquiry. *Educational Technology Research and Development* 47(2): 7-18.

Feenberg, A. (1989). "The written world: On the theory and practice of computer conferencing". *Mindweave*: *communication, computers and distance education*. R. Mason and A. Kaye. Oxford, Pergamon Press: 22-39.

Hannafin, M. J. (1992). Emerging technologies, ISD, and learning environments: Critical perspectives. *Educational Technology Research and Development* 40(1): 49-63.

Hara, N. and R. Kling (2000). *Students' Distress with Web-based Distance Education Course*. Bloomington, IN, Centre for Social Informatics, Indiana University.

LaMaster, K., E. Williams and N. Knop (1998). Technology Implementation: Let's Do It! *Journal of Physical Education Research and Dance* 68(7): 12-15.

Lane, D. R. and M. W. Shelton (2001). The Centrality of Communication Education in Classroom Computer-Mediated-Communication: Toward a Practical and Evaluative Pedagogy. *Communication Education* 50(3): 241-255.

McWilliam, E. (1997). No body to teach (with)?: The technological makeover of the university teacher. *Australian Journal of Communication* 24(1): 1-8.

Meek, V. L. (1997). Sociology of Higher Education. *International Encyclopedia of the Sociology of Education*. L. J. Saha. Oxford, Pergamon: 173-187.

O'Hagan, C. (1995). Interaction - Negative. ICDE95-L. URL http://www.ualberta.ca/~tanderso/icde95/interaction_www/0033.html, Accessed 31 May, 2002.

Rada, R. and T. Henderson (1998). Mechanistic Classroom, Assignment Difficulty, and Peer-Peer Assessment. *Virtual University Journal* 1(4): 183-192.

Reeves, T. (1997). Evaluating What Really Matters in Computer-Based Education, URL http://www.educationau.edu.au/archives/cp/REFS/reeves.htm, Accessed 30 May, 2002.

Roberts T S (2002), Academics in Academia: The Forgotten Resource in the Rush to New Technologies, *Educational Technology & Society* 5 (2): 164-171, April 2002, ISSN 1436-4522

Schon, D. A. (1995). The new scholarship requires a new epistemology (theory of knowledge). *Change* 27(6): 26.

Slavin, R. E. (1992). Cooperative Learning. *Encyclopedia of Educational Research*. M. C. Alkin. New York, McMillan: 235-238.

Snoke, R. and Underwood, A. (2000) "Generic Attributes of IS Graduates - A Comparison of Australian Industry and Academic Views." *PACIS 2000*: June 2000.

Weiner, G. (1990). Ethical Practice in an Unjust World: educational evaluation and social justice. *Gender and Education* 2(2): 231-238.

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