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OVERCOMING "PROCESS- BLINDNESS" IN THE DESIGN OF AN ONLINE ENVIRONMENT: BALANCING COGNITIVE AND PSYCHO-SOCIAL OUTCOMES

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Abstract

Learning environment research can contribute to our understanding of how psychosocial processes need to be balanced with cognitive outcomes in the design of units of study. The research on Web-based learning supports the assumption that the nature of social interaction affects student outcomes and student perceptions of the quality of the learning experience. The purposeful this study is to examine student perceptions of psychosocial processes in a blended learning environment using a learning environment survey tool. Students assessed the environments as favourable, but found that the quality of dialogue and peer support offered did not meet their needs. Implications for online design are considered.

Keywords

online design, evaluation, psycho-social, learning environment, student perceptions

Introduction

Research conducted during the last decade has affirmed the need for students to demonstrate both academic and social outcomes, and that both must be integral to the learning experience. As academics increasingly take more responsibility for their designing and creating resources and learning spaces for their students, the field of learning environment research has expanded (Dorman, 2002). Complementary findings that need to be taken note of are that both cognitive and affective dimensions of learning are inseparable, and that greater involvement of students in discussion, peer learning and social activity leads to improved learning and engagement. Nevertheless, evaluation studies do not always address the issue of whether students' learning environments are more or less positive. Jacques (1991:72) commented that "a lack of attention to the socio-emotional dimension means that many of the task aims cannot be achieved". Without a climate of trust and co-operation, students will not feel like taking the risk of making mistakes and learning from them. Rourke et al (1999) propose a community of inquiry model where learning occurs through the interaction of three core components; cognitive presence, teaching presence and social presence. Laurillard's (2002) iterative model of conversational dialogue leading to learning is an example of a communication model that can involve learners socially and cognitively. All three theorists recognise the primacy of the social dimension to learning.

There are several empirical studies attesting to negative learner experiences online, and to feelings of anonymity and isolation. Wegerif's (1999) study of an online group of learners found that individual success related to the degree to which participants were able to cross a threshold from feeling like

outsiders to becoming insiders. Social factors such as the degree of support, connectedness and peer feedback have been found to be powerful determinants of success and satisfaction in online courses of study (Barab, Thomas & Merrill, 2001). With this substantial body of research pointing to the need for environments that balance social, cognitive and affective dimensions of learning, instructional designers need to attend to all aspects in the creation of effective online design. The goals of this paper are to describe the application of learning environment research to the design of an online unit of study, to document the features that support social and cognitive outcomes and to provide an evaluation of student learning using an appropriate instrument. The main thrust of the paper is to draw on an extensive body of educational research in the wider field of learning environment research and social psychology, and to suggest a systematic approach to both design and evaluation using this research. A brief background on learning environment research is provided that suggests the potential for application to the design of an online unit of study. The methodology used is outlined, emphasising the application of a learning environment instrument. Results of the qualitative method of evaluating student perceptions are presented together with an analysis of findings.

Learning environments research

From the 1970's research on the conceptualisation and assessment of learning environments has developed rapidly. Studies of traditional classroom environments at primary secondary and tertiary level have provided convincing evidence that the quality of the learning environment is an important determinant of student learning (Fraser, 1994). Because the concept of including a psychosocial dimension in the learning environment resonates with practitioners, this field has become an attractive field of study by teachers and educators who are interested in understanding the human dimensions to learning in a range of contexts. Psycho-social dimensions would include such aspects as group cohesiveness, satisfaction, social interaction, task orientation, self-direction and teacher support.

Since the early 1960's, research in social psychology has identified that psychosocial dimensions of learning environments are a decisive component for successful learning outcomes (Anderson and Krathwohl, 2001). Since then, numerous studies have demonstrated that students' perceptions of their educational environments can be measured with survey instruments and the results serve as valid predictors of learning (Fraser, 1997, 1998a, 1998b). Evaluation has turned away from individual student achievement toward the effectiveness of the environment, while the focus of learning has moved from individual student achievement toward the effectiveness of the environment as a learning community. Brown & Duguid's (2000) claim that the social processes involved in getting a degree are equally important, because much learning comes with the quality of interactions that occur in the communities to which students belong.

Despite the fact that controversies abound about the impact of media on learning, institutions are increasingly placing their courses and units of study online, and there is also concern about how best to facilitate online learning and increase learner support (McLoughlin, 2002). Teachers often define and design the environment based upon their perceptions of student needs while students contribute to the design process through feedback and evaluation processes. Students are key stakeholders in their educational experience, as they spend both time and money on services and their reactions to and perceptions of the learning experiences needs to be drawn upon and utilised in the design and improvement of learning environments. Research has shown that there is a link between learners' perceptions of the psychosocial characteristics of their classrooms and their learning achievements and viewpoints (Fraser, 1991; McLoughlin, 2003). There are several studies that have used motivational frameworks such as Keller's (1983) ARCS model successfully to create learning environments where motivation and affect are key design elements (Main, 1993; Cornell & Martin, 1997). Instructional designers can utilize learning environment research to discover differences between their perceptions and those of their students and then attempt to make improvements in the actual classroom environment based upon the perceptions and learning preferences of students.

Learner-centered environments

In accordance with the learner-centered movement, in ascendency since the publication of the *Learner Centered Principles* by the American Psychological Society (APA, 1993), learning environments should provide opportunities to construct knowledge, to allow students to actively share and seek information, to generate a diverse array of ideas, to appreciate multiple perspectives, to take ownership in the learning process, to engage in social interaction and dialogue, to develop multiple modes of representation, and to become more self-aware (Chong, 1998; Oliver & McLoughlin, 2001). Simply stated, technology-rich environments can support learner engagement in meaningful contexts, and through active learning, increase learner ownership over their own learning. Learner-centered pedagogy asks what students need to learn, what their learning preferences are, and what is meaningful to them (Wagner & McCombs, 1995). Web-based instruction provides opportunities for learning materials, tasks, and activities to fit individual learning styles and preferences. Networks for learning information, such as digital libraries, virtual teams and online discussion groups, are available to meet student interests and ideas. Such environments also provide access to more authentic learning experiences than are typically found in conventional educational environments.

Research commissioned by Education Queensland makes specific mention of supportive classroom environments as one of the dimensions of the *Productive Pedagogies Framework* (Queensland Government, 2002). Table one shows the five constructs related to the key dimension of supportiveness (Dorman, 2002). While these dimensions have been applied to primary and secondary level classrooms, they also contain key socio-cognitive elements that are applicable to learning environments at tertiary level, and are supported by the research conducted by the American Psychological Association (APA) and the of 14 *Learner-Centered Psychological Principles* (LCPs). These are based on research from the fields of learning and instruction, motivation, and development since the re-emergence of cognitive psychology in the 1970s and 1980s.

Dimension	Description
Student Direction	Do students determine specific activities or outcomes of the lesson?
Social Support	Is the classroom characterised by an atmosphere of mutual respect and support among teachers and students?
Academic Engagement	Are students engaged and on-task during the lesson?
Explicit Quality Performance Criteria	Are the criteria for judging the range of student performance made explicit?
Self-regulation	Is the direction of student behaviour implicit and self-regulatory?

Table 1: Key dimensions of a supportive classroom environment according to the productive pedagogies framework.

Survey instruments developed to evaluate learning environments

The use of instruments to evaluate the psychosocial dimensions of learning environments is now an accepted approach to evaluation. Various literature reviews suggest that there are three general approaches to the assessment of learning environments: (1) the use of trained observers to code events, usually in terms of explicit phenomena, (2) the use of student and teacher perceptions obtained through questionnaire administration, and (3) the use of ethnographic data collection methods (e.g. Chavez, 1984; Fraser, 1991, 1994; Genn, 1984). In general, the first two approaches have relied on quantitative data collection methods and statistical analyses. Classroom environment research has a history of psychometric approaches employing quantitative and survey research that has focused on the development and validation of instruments to assess specific dimensions of the classroom environment, but qualitative research approaches are gaining increased emphasis.

Learning environments research has generated a number of survey instruments related to ICT usage in classrooms or laboratories, and computer-mediated communication in a range of settings. Related research reported by Walker (2002) includes studies of computer-mediated learning environments specific to teacher education (Admiral, Lockhorst, Wubbels, Korthagen & Veen, 1998; Goh & Tobin, 1999), computer-facilitated learning environments in higher education (Bain, McNaught, Mills & Lueckenhausen, 1998), and distance learning environment design (Spector, Wasson & Davidson, 1999). However, only one instrument, the Distance and Open Learning Environment Scale (DOLES), developed in 1995, has a deliberate focus on distance education among university students. For tertiary computer facilitated learning contexts, the *Constructivist Learning Environment Survey* (CLES) was developed by Taylor, Fraser & Fisher (1997). Maor and Fraser (1997) adapted the environment survey further, and it was again modified by Taylor & Maor (2000). Other contextually derived survey instruments have been used to assess social presence using a range of social and psycho-social dimensions (Fulford & Zhang, 1993; Rourke, Anderson, Garrison & Archer, 1999).

The present study used an adaptation of the CLES original survey tool, but narrowed it down to particular dimensions that were designed to draw out the social and metacognitive aspects of the environment that was designed. The survey instrument was developed to assess the strength of the learning environment in meeting student needs in the following areas:

- Student-student dialogue
- Scaffolding and support
- Metacognitive demands
- Authentic task orientation.

Context of the study

Final year students enrolled in a tertiary unit in educational technology and interactive multimedia are required to develop skills and expertise in project managing the development of multimedia product, such as CD-ROM's and web sites. These skills are taught through a unit of study where students develop team-based projects using project management techniques. They are required to create a project proposal (needs analysis, feasibility, scope and legal contract), design specification (storyboards, concept maps and rapid prototypes), evaluation, create metrics and address copyright/intellectual property issues as well as issues related to professional skills and teamwork.

The unit consists of thirteen, three-hour class sessions that runs over one full semester. Each session consists of a one-hour lecture followed by a two-hour tutorial. Team skills and collaboration are continually promoted and reinforced throughout the unit with teams of four students working together to promote the development of project management and generic skills. Required student learning outcomes are to:

- Apply a range of project management and generic skills appropriate to the development of multimedia projects including time management, collaboration, communication, self-assessment, peer-assessment, task management, problem solving, information management and teamwork skills;
- Make a significant contribution to a team-based multimedia development project;
- Demonstrate an understanding of how project management models, needs analysis, timesheets, categories, planning, scheduling and costing are used to develop metrics and feasibility studies;
- Develop legal contracts which consider all the relevant aspects for multimedia development
- Use planning tools such as storyboarding, concept maps and prototyping to develop design specs;
- Design and apply quality assurance procedures for testing, formative/summative evaluation strategies, procedures, file naming and templates development; and
- Demonstrate an understanding of the nature of the specialist roles of instructional designers, content experts, computer programmers, graphics designers, project managers, "evaluators", and others when developing a multimedia product.

For unit assessment, students are required to complete two team-based assignments -a project proposal, and the final product which is a web site that includes a presentation and evaluation of the product. The team-based assessments consist of the following components:

- The development of a web product, addressing fixed criteria;
- Completing eight online tasks and giving feedback given to other students. Students are required to research the tasks/problems by considering all the given resources (book, readers, lecture notes and URL's) to produce an online solution that is assessed by three other teams, as well as the tutor.
- a self and peer assessment score, negotiated with the team. This encourages students to carefully consider their role and contribution in relation to the others while working in a team.

At the time of this study there were 80 students, and the unit was delivered in face-to-face format as well as through the web site in order to make the learning resources available to both internal and external students and also to enhance the quality and flexibility of the learning environment.

Design of learning environment

Learning activities were designed with a view to promote self-regulation, team skills, social and peer accountability as well as reflection while working on authentic tasks (Figure 1). In week three of the semester, students were required to complete an online contract that outlined their responsibilities in the team. They then were able to complete confidential self and peer assessments about the progress of their peers, as stated on the contracts.

These instructional strategies are discussed below in related to how the data was collected and analysed. The evaluation instrument was administered to all students during the latter half of the unit of study.

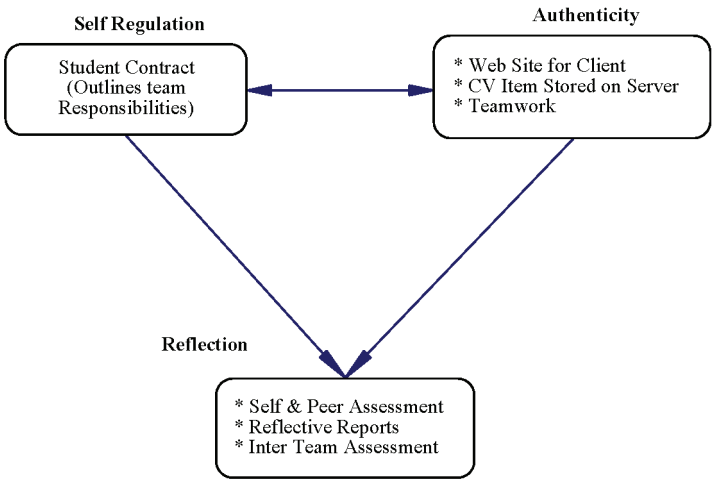

Figure 1: Design of the Learning Environment

Metacognitive Demands

Students were asked to consider four questions related to metacognitive demands made in the course (Table 2). Responses were varied, though most respondents considered the course "Sometimes" catered for metacognitive demands (Figure 2). However, within this dimension, it is interesting to note the question related to reflection "I have opportunities to reflect on my learning approaches" rated much higher than the other three questions.

The reflective aspect of the course was promoted through the three course design features. Online self and peer assessment journals, reflective reports and intra-team assessment. Self and peer assessment journals allowed students to report on their progress, and the progress of their peers to tutors using an online application. The tutor would then consider these comments and conduct a face-to-face seminar in which

issues of concern were raised and allowed student to articulate their concerns. This strategy allowed students to reflect on how accurate their assessment had been of peers, as well as their own performance within the team.

At the end of the semester, students were required to submit a reflective report outlining their progress during the semester, and discussing how they could make improvements to their team role and selected responsibilities. This represented seven percent of their overall assessment. Also, another assessment item required students to submit solutions to problems using an online application, and then assess the solutions of three other teams. This allowed students not along to view the solutions of other teams, but also to be given feedback from peers, and their tutor about the quality of their work.

Question	Almost Never	Seldom	Sometimes	Often	Almost Always
I am made aware of how I learn	0	3	6	3	2
I have opportunities to reflect on my learning approaches	0	0	2	6	6
I am asked to explain my ideas	0	2	7	4	1
Students learn that there are not always answers to problems	0	3	6	3	2
Totals	0	8	19	18	11

Table2: Metacognitive Demands

The results from this survey dimension indicates that more could have been done by helping students understand how they learn, and different strategies of how to learn. Perhaps an instrument and information helping students determine their individual learning styles would have been useful in this unit, which encouraged a high level of self-regulation and autonomy.

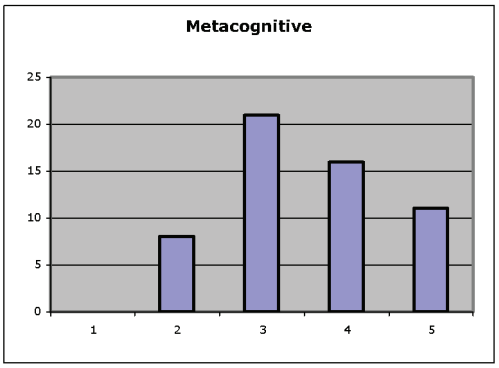

Figure 2: Metacognitive demands

Modelling and Support

Students were asked to consider four questions related to Modelling and Support given in the course (Table 3). Responses showed that students would have liked more examples to help them model what was required (Figure 3). This was shown by the responses to "I am provided with examples of effective strategies". This is perhaps a result of asking students to determine their own roles within the team, and then take responsibility for carrying these tasks. Within this environment, it can be difficult to provide modelling and support for all the different roles taken by students. However, an alternative strategy may be considered in which flexibility is given to students to take different roles, though scenarios and exemplars are given to help illustrate what is required.

Question	Almost Never	Seldom	Sometimes	Often	Almost Always
I am provided with examples of effective strategies	0	3	7	3	1
I am allowed to question how I am learning	0	2	5	5	2
Students can ask for clarification about activities that are confusing	0	0	2	7	5
Students can let instructors know if they need more time to complete an activity	0	3	4	5	2
Totals	0	8	18	20	10

Table 3: Modelling and Support

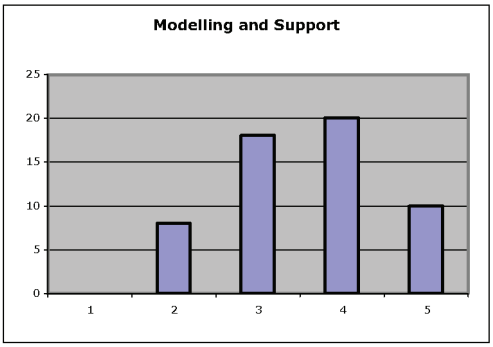

Figure 3: Modelling and Support

Student to student dialogue

Students were asked to consider four questions related to how effectively student to student dialogue was promoted in the course (Table 4). Responses largely showed that students felt dialogue between students in relation to explaining ideas and working on problems wasn't that strong, with most responses scoring it at "Sometimes" (Figure 4). This was a surprising result, as the assessment required 50% teamwork, and students were required to communicate and collaborate with their peers on a regular basis. When asked why this was the case, students stated that even though they met on a regular basis, they discussed assessment issues that were often not related to problems in their own areas of responsibility as they perceived they didn't have enough time to discuss all these issues. Usually if a problem came up, they usually took the quickest solution or option, and generally asked the team member to determine the best form of solution.

Question	Almost Never	Seldom	Sometimes	Often	Almost Always
Participants talk with other participants about how to solve problems	0	1	5	6	2
Participants explain their ideas to other participants	0	2	5	5	2
Participants ask other participants to explain their ideas	0	2	7	5	0
Participants ask me to explain my ideas	0	3	6	5	0
Total	0	8	23	21	4

Table 4: Student-Student Dialogue

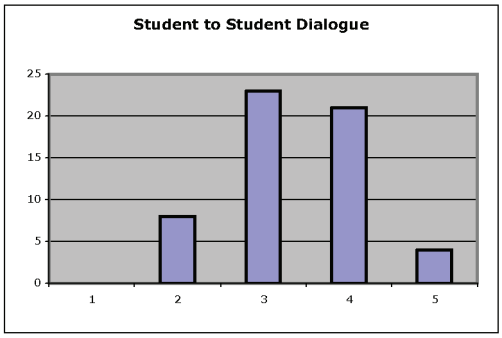

Figure 4: Student-Student Dialogue

Even though the unit promoted much student-to-student dialogue through team based assessment strategies, students felt that student-to-student dialogue related to problem-solving and generating ideas was not highly successful.

Self Regulation

Students were asked to consider four questions related to how much autonomy was provided in the course (Table 5). Responses to this dimension were quite strong with students indicating that course provided a large degree of choice and ability to set their own goals, as well as how time they could spend on selected activities (Figure 5). This would have been directly related to the course design feature of allowing students to choose their team role and commit to through the use of student contract that was signed and agreed to by the whole team and the tutor. This allowed students the freedom to choose what role, skills, and how much time they wanted to spend on activities that they felt promoted their skill sets for future employment opportunities.

Question	Almost Never	Seldom	Sometimes	Often	Almost Always
Students can decide how much time to spend on an activity	0	0	2	6	6
I have an opportunity to set my own goals for learning	0	0	0	6	8
Participants have input what they are going to learn	0	0	2	4	8
Students can choose the place and time they prefer to study	0	0	2	6	6
Total	0	0	6	22	28

Table 5: Self-Regulation

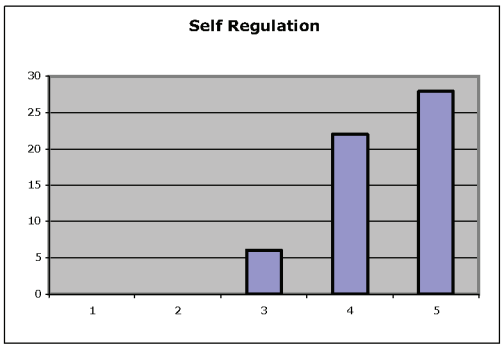

Figure 5: Self-Regulation

Authentic Task Orientation

Students were asked to consider four questions related to how authentic the tasks provided in the course were (Table 5). Responses to this dimension were again quite strong with students indicating that course provided highly authentic activities that were relevant and interesting to the students (Figure 7). These opinions would have been related to the assessment tasks that required students to develop a web for a client that would be hosted on university severs, along with all the relevant information. Students recognised that the final product could be used as part of their CV to help gain employability in the future - as they were all final year students. The perceived relevance of the assessment tasks and their application to employment related contexts was a highly motivating feature of the course.

Question	Almost Never	Seldom	Sometimes	Often	Almost Always
The learning takes focus on issues that interest me	0	0	1	5	8
What I learn connects well with what I will do in my future professional practice	0	0	0	7	7
I learn how to solve real-life problems	0	0	1	5	8
What I learn connects with what I already know	0	0	0	7	7
Totals	0	0	2	24	30

Table 6: Authentic Task Orientation

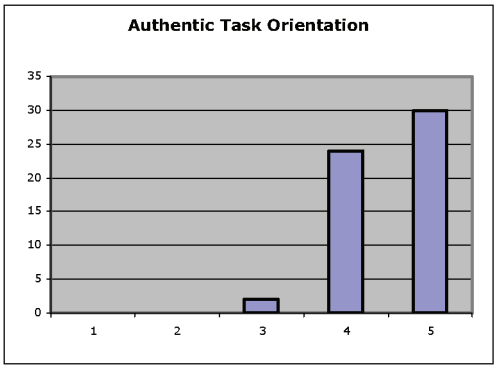

Figure 6: Authentic Task Orientation

Conclusion

Fortunately, the Web is emerging as a viable teaching and learning platform for learner-centered instruction at the same time that there is a call for quality and client-centered approaches in education. Increasingly the design process begins with a partnership with, and recognition of student needs and interests. Often, evaluation of learning environments are silent about student perceptions of the psycho-social processes involved in the learning process. With the ongoing evolution of web-based learning, the dimensions of what constitutes a successful and satisfying learning environment will change and research will lead to new refinements of what constitutes effective cognitive and social presence for e-teachers. This paper commenced with a call to consider the contribution that learning environment research might make to evaluate the quality of such dimensions, by utilising and adapting existing instruments developed for this purpose. The study then administered an adapted instrument to assess student perceptions of key aspects of the environment ie self-regulation, metacognitive demands, student-student dialogue and authentic task orientation. These dimensions were the focus of the evaluation as they were aligned to key aspects of the online design. The results of the evaluation showed that the environment did not meet the needs of students fully. The student-student dialogue and mutual support offered were found to be lacking. This may have been due to the many assessment tasks the students were required to complete, and the heavy time commitment incurred by the unit. In terms of metacognitive demands, opportunities for self-regulation and

task orientation, there was a high level of satisfaction. The impact of this evaluation has been to reconsider how to fully integrate the social and supportive elements in the overall course design. A stronger and more direct role for an online mentor is one strategy that will now be implemented, together with more scope for off-task social interactions prior to producing the final product.

The implications of the study are that designing learning environments need to take account of both cognitive and socio-affective dimensions of student needs. Relating these findings to the literature on quality learning, the evidence is that students are well attuned to the need for support, structure and meaningful tasks that match their learning preferences. The onus is therefore on instructional designers and educators to create quality learning experiences through the design of environments that meet learner needs.

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