



Postgraduate students' knowledge construction during asynchronous computer conferences in a blended learning environment: A Malaysian experience

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Blended learning, using e-learning tools to supplement existing on campus learning, often incorporates asynchronous computer conferencing as a means of augmenting knowledge construction among students. This case study reports findings about levels of knowledge construction amongst adult postgraduate students in six asynchronous computer conferences in a blended learning environment. The aim is to document and understand the kinds of task related postings in asynchronous computer conferencing that foster knowledge construction. The tool for analysis is an adaptation of the model by Veerman and Veldhuis-Diermanse (2001). Data were collected from *Quickplace*, the e-learning system at Universiti Malaysia Sarawak, with 22 adult postgraduate students enrolled in the Masters of Science in Human Resource Development who were attending a 14-week course on Cognition and Learning. The results showed that the students were active in constructing knowledge but limited to seeking and giving opinions among peers and knowledge telling. The prevalence of low level knowledge construction points to the need for the e-learning facilitator to encourage the students to go beyond regurgitating facts of what they have learned. More guidance should be given to the students to refrain from mere knowledge telling. Results suggest that there are blended learning benefits for these students as they are given improved opportunities to learn outside the classroom.

Introduction

Current practices in institutions of higher learning indicate that the use of information and communication technologies (ICTs), in particular e-learning, is increasing at a great pace (Ewing & Miller, 2002; Hmelo-Silver, 2003; Hong, Lee & Liao, 2005; Schellens & Valcke, 2005; Woo & Reeves, 2007; Young & Norgard, 2006). E-learning is defined as the use of Internet technologies to deliver a combination of learning contents and instructional methods to enhance a learner's knowledge and performance (Rovai, 2004). E-learning systems such as *WebCT* and *Blackboard* are popular among educators and can integrate a variety of functions. For example, these systems can incorporate instructional materials using audio, video and text, email, online conferencing, forums, quizzes and assignments and the Web. Instructional delivery

and communication between instructors and students can be conducted synchronously (at the same time) or asynchronously (at different times), offering a variety of instructional aids, communication methods and flexibilities in terms of place and time of instruction (Hong, 2002).

Many educational institutions have invested in e-learning. For example, in the United Kingdom, the Higher Education Funding Council for England (HEFCE) has published its e-learning strategy, which sets out strategies and implementation plans for supporting e-learning in higher education institutions. HEFCE was reported to be allocating 33 million UK pounds in capital funding for e-learning (HEFCE, 2005).

In e-learning environments, one of the most common types of communication is asynchronous conferencing. In asynchronous conferencing, learners usually interact with each other at different times via text messages allowing them more time to reflect, think and search for additional information when compared with synchronous conferencing (Frank, Kurtz, & Levin, 2002; Hong, 2002; Jonassen, 2001; Woo & Reeves, 2007, Wu & Hiltz, 2004; Young & Norgard, 2006). Within the scope of adult and postgraduate learning, e-learning and asynchronous conferencing have gained popularity and acceptance because the time to travel physically to and from institutions of learning is now compensated by online accessibility and hence offers much convenience that extends beyond the walls of the physical classroom (King, 2002).

Furthermore, Shellens and Valcke (2005, 2006) in their study on the existence of knowledge construction in asynchronous conferencing found that collaborative online discussion groups were very task oriented and that high phases of knowledge construction were exhibited. Other studies such as Pena-Shaff and Nicholls (2004) have shown that students in asynchronous conferencing were engaged in knowledge construction processes and produced more reflective monologues. However, in a study among postgraduate students in an e-learning statistics course at a tertiary institution in Malaysia, Hong (2002) reported that although there was some evidence of critical thinking during the asynchronous conferencing, the discussions were generally at low levels of knowledge construction.

Blended learning environments

Blended learning refers to the hybrid of traditional face to face and e-learning, where the e-learning is meant to enhance students' learning by taking advantage of the anytime, anywhere features of e-learning technologies (Egan, Jefferies & Johal, 2006; Ginns & Ellis, 2007; Oliver & Trigwell, 2005; Reasons, Valadares & Slavkin, 2005; Wu & Hiltz, 2004). There are various versions of blended learning where some universities may have an initial face to face meeting, weekly online assessments and online discussions, and a final face to face meeting with an examination (Rovai, 2004). Other universities reduce the face to face sessions to one-third of the time usually needed to meet, for example, a one-hour face to face session instead of a three-hour session.

In the case of Universiti Malaysia Sarawak, the use of e-learning is meant to act as a complementary learning support system, while not reducing the duration of face to face sessions. It is the University's policy to offer blended learning rather than distance learning education at the undergraduate and graduate levels of learning (Hong et al., 2005; Universiti Malaysia Sarawak, 2002). In Unimas, the face to face sessions run as normal and students meet their course facilitator for three hours per week for a three-credit course. The e-learning facility is meant to allow the students to participate in asynchronous conferences, to ask questions, and to construct meanings of the domain knowledge acquired inside and outside class.

Purposes of the study

With the increasing use of blended learning and asynchronous computer conferences, educators should assess the quality of interactions and learning that take place in this e-learning environment. According to Hmelo-Silver (2003), Walker (2005) and Woo and Reeves (2007), documenting collaborative knowledge construction is critical for research in asynchronous conferencing and e-learning environments. Thus, the goals of this study were to document the types of knowledge that were constructed during the asynchronous conferencing and evaluate the quality of knowledge construction taking place in a blended learning environment for a postgraduate course at a Malaysian tertiary institution.

Review of related literature

The benefits of e-learning, blended learning, and asynchronous computer conferencing are well documented in the literature (Frey, Millie & Alman, 2006). Asynchronous computer conferences are convenient because they are not time or place dependent. Not only can students respond at their own pace, they all have an equal opportunity to express themselves (Pallof & Pratt, 2002; Frey et al., 2006). Asynchronous computer conferencing provides a permanent record (Meyer, 2004) of interaction that is easy to archive and search. In addition, asynchronous computer conferences are collaborative, which allows for a social construction of knowledge (Walker, 2005). Positive learning outcomes are also attributed to the thoughtful reflection required in composition of computer conference postings (Allan, 2004). Furthermore, writing-to-learn literature describes writing as a way to reflect, analyse, and communicate important ideas and concepts, as Elbow (1994, p. 4) stated, "Students understand and retain course material much better when they write copiously about it." According to Walker (2005), common writing assignments such as answering and responding to other learners' discussion questions, analysing case studies, writing reports, research papers, project summaries and collaborative written assignments, such as developing team reports on specific topics, group answers to discussion questions, debates and critiques of arguments can enhance knowledge construction.

Student reflection is often prompted by questions that serve one of two functions – they are either centering (questions that promote convergent thought) or expanding

(questions that promote divergent thought) (Hunkins, 1972). Blanchette (2001) found that asynchronous computer conferencing allows for higher levels of cognitive questions that encourage critical thinking. Learners have more time process questions and develop responses, and the learner's cognitive level of response often matches the cognitive level of the questions asked. Muilenburg and Berge (2000) agreed, reporting that the level of student thinking is directly proportional to the level of questions asked.

The benefits of asynchronous computer conferencing have led several researchers to further explore student interaction and develop models and tools for asynchronous computer conferencing analysis. There are several types of analysis, including frequency of postings and content analysis. Content analysis studies have generally been qualitative and explore issues such as problem solving or critical thinking (Garrison, Anderson, & Archer, 2001; Meyer, 2004; Rourke & Anderson, 2004; Veerman & Veldhuis-Diermanse, 2001). Quantitative studies focus on measures such as frequency of postings, which may include the number of threads per conference, the number of postings per thread, or the number of instructor postings per thread (Mazzolini & Maddison, 2003; Monroe, 2003).

In view of the increasing use of asynchronous conferencing in blended learning, there is a need for analysis tools that review the process of knowledge development within these online discussions. Veerman and Veldhuis-Diermanse (2001) worked on a categorising model of knowledge construction based on social constructivist principles (Schellens & Valcke, 2006), and having two major categories: *task related* and *non-task related* discussions. There were four categories of non-task discussions. The four categories with examples of the posting are: (a) Planning: "Is it OK to discuss the arguments first?"; (b) Technical: "Do you know how to change the diagram window?"; (c) Social: "Smart thinking"; and (d) Nonsense: "What about a swim this afternoon?" (Veerman & Veldhuis-Diermanse, 2001). The task related discussions, on the other hand, consisted of three major categories. The three categories with examples of the posting are: (a) New idea: "Interaction means responding to each other"; (b) Explanation: "I mean that you integrate information of someone else in your reply"; and (c) Evaluation: "I don't think that's a suitable description because interaction means also interaction with computers or materials, see Laurillard's definition" (Veerman & Veldhuis-Diermanse, 2001).

Veerman and Veldhuis-Diermanse (2001) further elaborated that a *New idea* can be described as a task related posting, focused on relevant content that is not mentioned before. An *Explanation* is a posting in which information is refined or elaborated that was clearly stated before, but elsewhere in the discussion. An *Evaluation* message is more than a "Yes, what a good idea" message and often involves reasoning processes or justifications.

Veerman and Veldhuis-Diermanse (2001) used their model successfully for analysing knowledge construction in four studies with different groups of undergraduate

students at Utrecht University and Wageningen University in the Netherlands, using computer mediated communications (CMC) systems. They found that asynchronous CMC can provide students with more options to think and reflect on information, to organise and keep track of discussions, and to engage in large group discussions. Schellens and Valcke (2005) have also used Veerman and Veldhuis-Diermanse's model to investigate whether asynchronous discussion groups can enhance knowledge construction. Their study showed that the interaction of discussions amongst learners was very task oriented and reflected higher phases of knowledge construction.

Methods

A case study method was used to investigate the type of knowledge constructed and the quality of discussions that took place in the asynchronous computer conferencing, because neither variables nor potential causes of behaviour were manipulated.

Participants

The participants in this study were 22 adult students enrolled in the Masters of Science in Human Resource Development program, at the Faculty of Cognitive Sciences and Human Development, Unimas, taking the 14-weeks course, *KMK6063 Cognition and Learning* in September 2006. All the participants were adults who worked during the day at various public and private companies. Many of them were teachers, one an officer at the state library, and some were full time students. Only two of the participants had limited access to computers and one of them did not participate in the asynchronous computer conferencing.

Description of the course

The course *KMK6063 Cognition and Learning* was designed to equip the adult students with the knowledge, skills and attitudes required to understand, appreciate, and diagnose how humans learn. The students were given a set of weekly readings and they were encouraged to participate in the online course discussion as often as possible. As a three-credit unit course, the face to face activities of the course consisted of three hours of lectures, and the time spent online was unlimited. A maximum of five points were allocated to students who participated actively in the asynchronous computer conferences in the blended learning environment. Throughout the 14 weeks, there were six asynchronous computer conferences, which were initiated by the second author, the course and e-learning facilitator. The e-learning facilitator's function was to generate meaningful online discourse about the topics learned in class, to stimulate and monitor the discussions, and also to explain misconceptions about certain concepts.

Features of the course

The e-learning component of the course, illustrated in Figure 1, was meant to play a complementary role to the face to face learning sessions. The software, *Quickplace*, was

used to support the e-learning course and asynchronous computer conferences. A welcome note and information on the purposes of the e-learning course page were presented to orientate the students on e-learning.

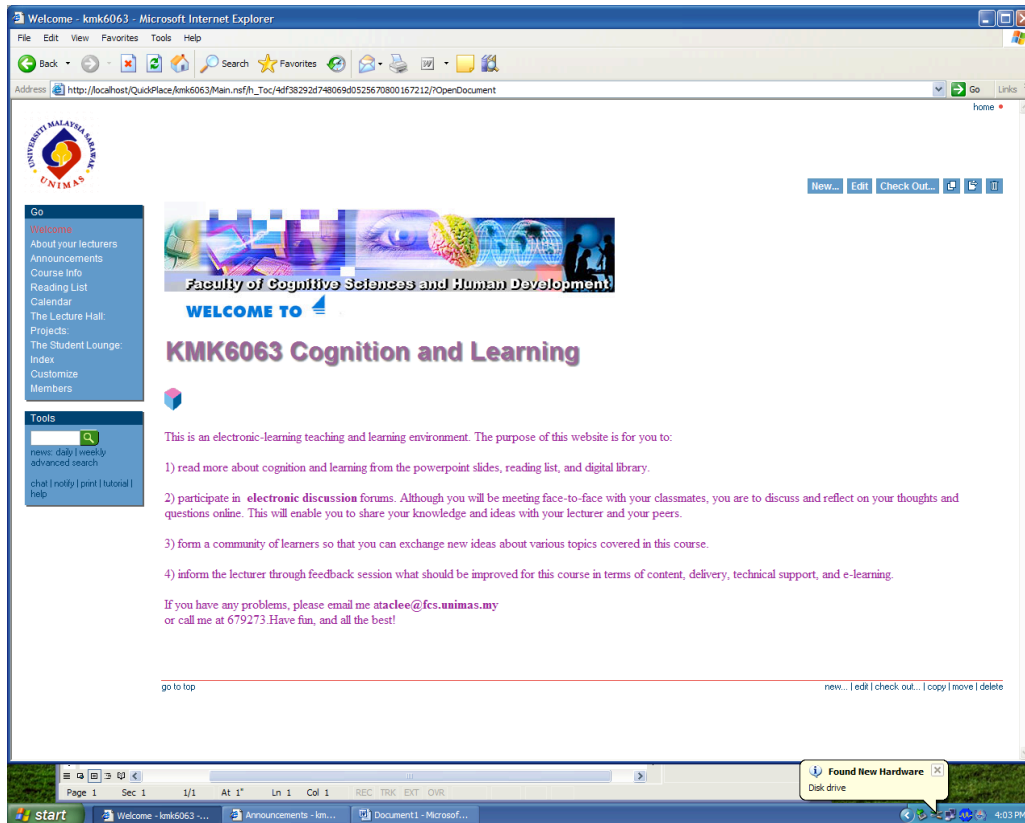


Figure 1: E-learning component of the course using *Quickplace*

Topics for the asynchronous computer conferences

Two examples of facilitator-led discussion topics in the asynchronous computer conferences, with some guiding questions of the convergent and divergent types (Hunkins, 1972) were:

1. Dear students, we have watched a video on Brain Learning on December 17, 2004 but we didn't have enough time to discuss in class. I suggest that we continue our learning process in the virtual space. Please write out three main points on how this particular video relates to your profession e.g.: teacher, employee of the inland

revenue, Bernas, Pustaka Negeri Sarawak, Everise etc. Try to focus your answers on the following questions:

- a. What is your impression of the video? (e.g.: if you like what you saw, tell us why. If you felt that the video was not interesting, give us your reason.)
- b. What are the three important features you noticed from the video? Why do you notice them?
- c. How does this video relate to your profession? How would you apply what you have learned at your place of work?

Post your responses. Comment and discuss on your friends' responses and queries.
- Julia

2. You will find in the attachment, three articles and one *PowerPoint* notes. Print out the three articles. Ask three most salient questions about the articles and discuss each others' questions. I have allocated marks for the online discussion – Julia

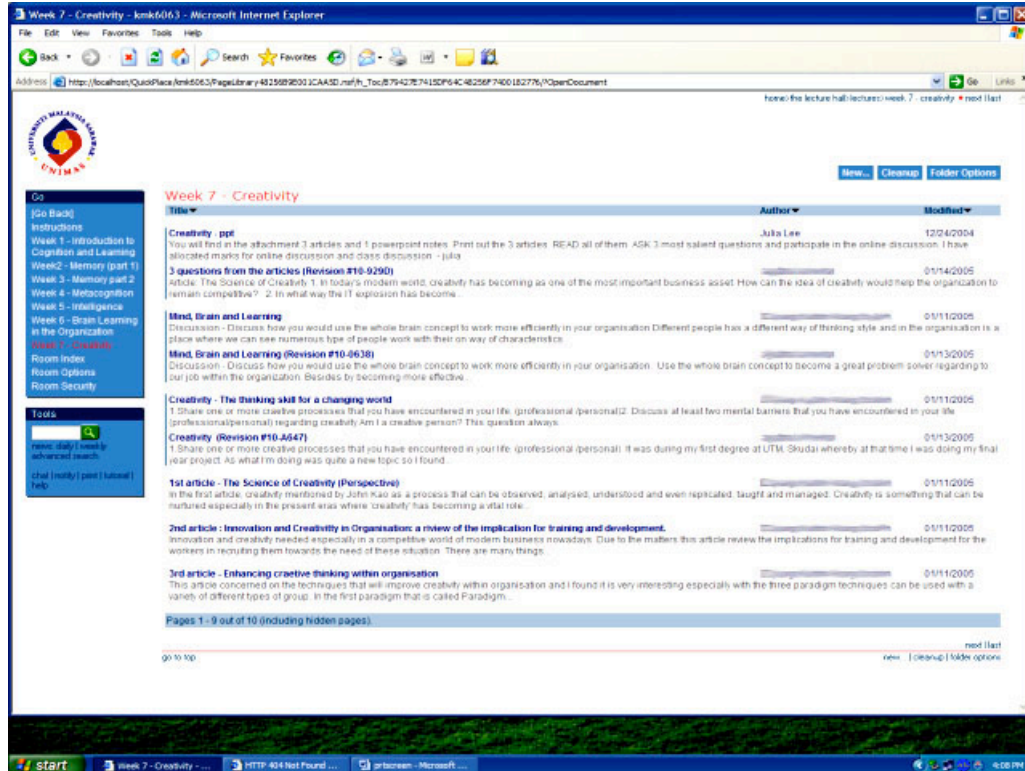


Figure 2: Example of a computer conference session

The discussions in the asynchronous computer conferences were in a threaded format making it easier for the students to follow the ongoing discussions. Students could click on any discussion thread and simply follow any discussion posted by their peers or the topics posted by the course facilitator as shown in Figure 2.

Data analysis

Initially, students' participation and the number of discussion postings were analysed using frequency measures. Content analysis was then used to analyse and describe the knowledge construction episodes in the asynchronous computer conferences. In this study, the researchers defined each meaningful sentence in the asynchronous computer conference posting as a unit of analysis. The sentences were smaller chunks of information that usually contain only one main piece of salient information (Gee, 1999). Each sentence was considered an independent discourse but at the same time dependent on the context of a bigger meaningful issue being discussed. Thus a computer conference posting by one student could comprise of a few units of analysis as shown in Table 1.

Table 1: Example of a computer conference posting and its units of analyses

Example of a computer conference posting	Unit of analysis	Code scheme
We cannot deny that in this modern world of technology, a lot of electronic devices have been creatively designed to make life easier such as hand phones... even more perfect than a human brain because it never fails to remember. My observation is human beings like you and me has been too dependent on electronic devices for remembering names,... lots of memory	1	Give opinion
... the human brain is never overloaded.	2	Incorrect knowledge telling
Just imagine if one day such devices just suddenly disappear from the earth, what are we going to do?	3	Ask for opinion
For something we don't like, we are also interested to remember what we don't like!	4	Give opinion

The analysis tool for the content analysis of the computer conferences postings was adapted from the model by Veerman and Veldhuis-Diermanse (2001). This tool was applicable to this study because of Veerman and Veldhuis-Diermanse's focus on the examination of collaborative learning as a process of knowledge construction, which is the main focus of this paper. The original categories for analyses are available in Veerman and Veldhuis-Diermanse (2001). The modified categories for analyses with examples are shown in Table 2. The major categories were *non-task related* discussion, *task related* discussion, and *facilitator* discussion. The facilitator category is an addendum to the Veerman and Veldhuis-Diermanse's (2001) model, which was not included in the original coding scheme. Modifications were also made to expand the task related category, from three sub-categories (*new idea, explanation and evaluation*), to seven sub-categories (*ask for opinion/ encourage participation, give opinion, with examples,*

knowledge telling, inaccurate knowledge telling, new idea, evaluation). Based on the definitions for the various sub-categories in the task related category, and with reference to the Revised Bloom's Taxonomy (Smythe & Halonen, undated), the sub-categories of *with examples, new idea* and *evaluation* depict higher levels of knowledge construction similar to the *analyse, evaluate* and *create* in the Revised Bloom's Taxonomy. On the other hand, the other sub-categories in the task related category are considered to be low level knowledge construction.

Table 2: Categorising asynchronous computer conference postings

Message		Definition	Example	Knowledge construction
Non-task related	Planning	Statement related to the procedure of team work / how the discussion should be conducted.	Shall we talk about the most important issues first?	No
	Technical	Statements related to the technical use of the e-learning software.	You can download any of the files below by dragging them to your <i>Windows</i> desktop. To open a file for reading, double click it.	No
	Social	Statements that serve to foster friendship / camaraderie.	Glad to hear from you all.	No
	Nonsense	Statements that are entirely irrelevant to the discussion proper.	I see birds flying in the book.	No
Task related	Ask for opinion or encourage participation	Asking a question but not connecting it to other threads or encouraging other members to participate.	Any suggestion to improve my marketing presentation?	Yes
	Knowledge telling	Statements based on regurgitated facts from the class or from readings without any connection to personal knowledge.	It was stated in the article that if you have an interest in remembering well, you will be able to remember.	Yes
	Inaccurate knowledge telling	Statements that are inaccurate and contain wrong facts.	... the human brain is never overloaded.	Yes
	Give opinion	Statements depicting participants' personal views, an interpretation or inference from the discussion.	People are different.	Yes
	With examples	Statements accompanied by supporting examples, concrete ideas, or application of knowledge.	Through visualised... organise the lessons in a limited principles and connecting content under common labels.	Yes

	New idea	Statements that present new thoughts about the discussion. This includes divergent ideas about the topics learned.	Sebelum tidur malam saya bercakap dalam hati bahawa saya akan bangun pada jam 4.00 pagi keesokan harinya. (Before I sleep, I tell myself in my heart that I will wake up at 4 a.m. the next day)	Yes
	Evaluation	Statements depicting appraisals, critiques, justifications made by the participants. Something that is more than a "yes, what a good idea." It requires reasoning and justification of thought.	I think we also can apply this to marketing present-ation. I think it would make the job of marketing much more easily and effective by knowing and understanding how people accept and process ideas.	Yes
Facilitator	Questions	Questions raised by the facilitator regarding the content learned.	Ask yourself questions: 1. is this a major task that you have to do in the organisation?	Yes
	Monitoring	Statements depicting the online moderator checking the ongoing group discussion; includes awareness of understanding.	Dear students, you are encouraged to...	Yes
	Explain concept	Statements that include the explanation, reason, or justification regarding the concepts learned.	A feeling of ownership and a sense of belonging to an organisation is constantly an issue faced by organisations...	Yes

Inter-rater reliability is a critical concern when conducting a content analysis (Wever, Schellens & Keer, 2006). In this study, two raters coded the data source. One was the second author and the other was a research assistant who was a Masters' degree student at that time. The research assistant was briefed on the coding scheme and trained on how coding was to be carried out. After the training sessions, each rater coded the computer conferences transcripts independently. Transcripts for one of the asynchronous computer conference were used as pilot data. For most cases, an agreement about the final code could be reached. The two raters coded all the transcripts of the six discussion topics. Two formulas were used to ensure the reliability of the data coded. Based on the percent agreement formula (Miles & Huberman, 1994), the resulting percent of agreement was 75.8% for the various categories mentioned in Table 2. The Cohen kappa coefficient (Cohen, 1960) was computed to be 0.71, which was deemed satisfactory (Huck, 2000).

Data collection

A total of six asynchronous computer conferences were conducted in the course. The participants' postings were captured from the *Quickplace* server and converted into

transcripts in Microsoft *Word*. Each of the computer conferences had a maximum of 18 course participants and the e-learning facilitator. Each asynchronous computer conference had an average of 75.8 units of analysis. The first asynchronous computer conference had 127 units of analysis, the second had 97 units of analysis, the third had 5 units of analysis, the fourth had 80 units of analysis, the fifth had 92 units of analysis, and the sixth had 54 units of analysis.

Results and discussions

Knowledge construction indicators

Referring to Table 3, the non-task related postings accounted for 1.5% of the total units of analyses for the six asynchronous computer conferences, task related posting contributed 87.0%, and the facilitator's discourse was 11.5%. This show that there were more task related postings than non-task related postings. Furthermore, students communicated more than the facilitator. This depicted a learner centered environment where the students' discourse was more than the facilitator's discourse. The top four sub-categories for the task related category were *with examples*, followed by *ask for*

Table 3: Summary of the non-task, task related and facilitator postings

Asynchronous CC postings		Frequency of unit of analysis						Total	Knowledge construction
		CC1	CC2	CC3	CC4	CC5	CC6		
Non-task related	Planning	0	0	0	0	0	0	0	No
	Technical	0	0	0	0	0	0	0	No
	Social	0	0	0	4	2	1	7	No
	Nonsense	0	0	0	0	0	0	0	No
	Totals	0	0	0	4	2	1	7 (1.5%)	
Task related	Give opinion	22	30	0	6	24	4	86	Yes
	With examples	29	2	0	19	18	40	108	Yes
	Knowledge telling	17	10	3	36	16	5	87	Yes
	Inaccurate knowledge telling	1	0	0	1	0	0	2	Yes
	New ideas	2	0	0	4	1	1	8	Yes
	Evaluation	3	0	0	1	0	0	4	Yes
	Ask for opinion or encourage participation	39	40	1	3	17	1	101	Yes
Totals	113	82	4	70	76	51	396 (87.0%)		
Facilitator	Questions	4	4	0	1	6	2	17	Yes
	Monitoring	3	5	1	5	6	0	20	Yes
	Explain concept	7	6	0	0	2	0	15	Yes
	Totals	14	15	1	6	14	2	52 (11.5%)	
Totals all postings		127	97	5	80	92	54	455	

Note: CC = Computer conference. CC1 refers to the first asynchronous CC and so forth

opinion or encourage participation, knowledge telling, and finally give opinion. There were very few *new ideas* and the peers hardly *evaluated* each other.

Quality of knowledge construction

The general overview of the asynchronous computer conference transcripts indicated that usually the same group of participants created the interdependent responses by sharing their ideas and building upon the ideas of others. Only a few participants picked up ideas from their peers and developed it and co-constructed the knowledge learned. The majority of the students did not comment on the postings of others and most of the postings were isolated and not collaborative in nature. Most of them tended to focus on answering the questions raised by the course facilitator rather than affirming, questioning or critiquing the ideas shared by others.

The three sub-categories of *with examples, new ideas, and evaluation* within the task related category, which was classified as high level knowledge construction, accounted for 120 units of analyses or 26% of the total units of analyses (refer Table 3). The lower levels of knowledge construction as depicted in the following sub-categories: *give opinion, ask for opinion and knowledge telling* had 274 units of analyses or 60.2% of the total units of analyses (refer Table 3). Thus, for this study, the course participants' conference postings were substantially in the lower levels of knowledge construction.

Thus, although the course participants found that the e-learning component of the course was helpful for learning outside class, as they could access the course site after class hours, the quality of their discussion and the level of knowledge construction remain superficial. Generally, this situation was reflective of the present condition of the Malaysian education system. Although the Malaysian school educational philosophy subscribed to the constructivist teaching philosophy, in tandem with development in the Western world, in reality it is still common to have teacher-centered classroom environments. Thus, these participants had come from a system that is didactic in its approach and it would seem that they were still not used to critical and creative discussion. These results were consistent with the findings reported by Hong (2002), for a group of postgraduate students enrolled in an e-learning statistics course in a Malaysian tertiary institution. Hong (2002) likewise reported that although there were examples of critical thinking, in most instances, the asynchronous discussions focused on low level thinking.

On the other hand, in the Western context, Pena-Shaff and Nicholls (2004), Shellens and Valcke (2005; 2006) and Veerman and Veldhuis-Diermanse (2001) found that collaborative asynchronous discussions in their studies were task oriented and there were high phases of knowledge constructions.

Suggestions for improving the quality of knowledge construction

Therefore, as suggested in Hong (2002), the findings in the present study indicated a need for a generic course on critical thinking to be conducted during the initial stages

of Masters degree programs at Malaysian tertiary education institutions. Furthermore, although lurking was not investigated in this study, it has been found to be common in most asynchronous computer conferencing (Rovai, 2000). Course designs on blended learning should include the asynchronous computer conferences as a graded element of the course, to encourage active participation. Yet this appears to be inadequate in the present study, as although the students were informed that their participation in asynchronous computer conferences would be graded, many of them sent brief messages without elaborations, which were in the *give opinion*, *ask for opinion* and *knowledge telling* sub-categories.

A study conducted by Rovai (2000) showed that an e-learning facilitator need not reply to all of the postings made by students. What is important is the feeling by contributors that their work is read by others. Rovai added that the facilitator should have a good sense of timing about when immediate feedback should be provided. This calls for further research on when the facilitator should reply to students and how a reply should be made, to improve the quality discussions in asynchronous computer conferencing.

Many of the students attempted to answer the questions rather than to debate or question the postings made by their peers or the facilitator. This bring into focus the need to expose students to good questioning practices, especially those that can develop students' thinking and reasoning skills (Barrows, 1992).

Furthermore, Ewing and Miller (2002) suggest that learners must shoulder individual responsibility and accountability during asynchronous computer conferencing. This view is congruent with the argument made by Slavin (as cited in Rovai, 2000), a proponent of collaborative learning, that group goals and individual accountability should also be implemented as a climate setting process prior to the asynchronous computer conferencing activities.

Limitations of the study

The limitations of this study, such as the sample size and the duration of study, limited the extent to which they may be generalised. This study was presented to promote deeper and further discussion about knowledge construction in blended learning environments.

Conclusions

The findings from this study indicate that adult postgraduate students could benefit from training and degree programs incorporating blended learning environments with asynchronous computer conferences, as a means for them to keep in touch with each other beyond the walls of the class, anytime, anyplace thus realising a self directed learning experience.

Discourse analyses showed that the learning environment was learner centered, but the quality of knowledge construction can be improved. Low level knowledge construction postings were a substantial proportion, pointing to the need for the facilitator to encourage the students to go beyond regurgitating of facts. Several ways are suggested to encourage higher order thinking discussions. More guidance should be given to the students to refrain from merely knowledge telling. The e-learning facilitator could model the dynamics of sharing information and transforming knowledge learned. Learner centered structures and explicit training or climate setting sessions should also be implemented to help the participants to critically analyse and synthesise the knowledge they have learned.

From the discussions above, although research in the Western context has shown that there are possibilities for quality knowledge construction in asynchronous computer conferencing, it is not easily attainable, especially in Eastern cultures. There is a need for future research on how various other variables influence high quality knowledge construction. These include course design, the critical thinking skills that students possess, and when and how feedback can influence the quality of knowledge construction of learners in asynchronous computer conferencing for a blended learning environment.

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