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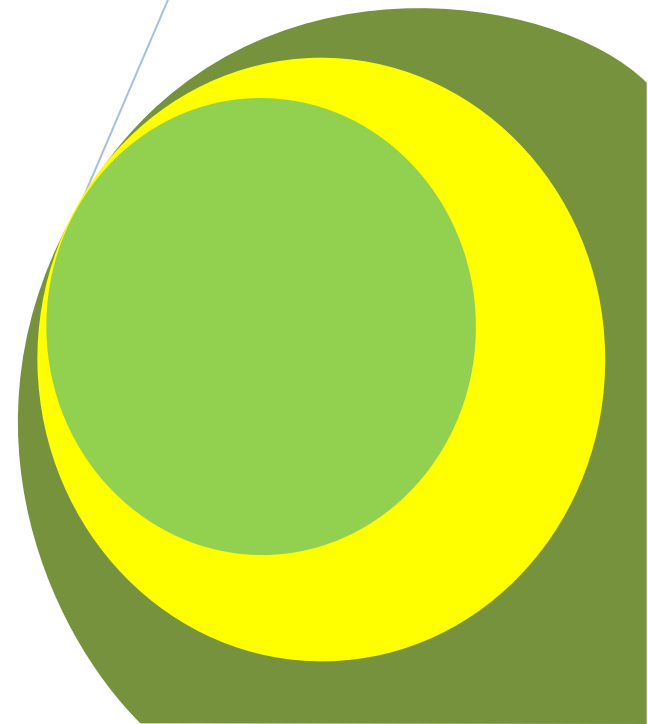
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Research Article

Enhancing Learning through Collaboration in an Online Discussion Forum: Students' Perceptions in a Computer Architecture Course

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ABSTRACT

This article describes the results of a qualitative analysis of online learning to support traditional learning forming a blended approach by introduction of an asynchronous discussion forum in a Learning Management System. A group of computer science students were introduced to an online discussion forum where they are able to participate and work together in order to build on their knowledge by posting to a number of discussion threads and sharing resources in an effort to enhance learning. Factors related to enhancing student engagement among online learners resulting from this study includes developing understanding of concepts by reading comments by other students, flexibility of access to learning materials and learner control over the pace of study aimed at developing greater learner reflection. A discussion forum has been chosen in a Learning Management System in order to achieve one learner community where materials can be shared and knowledge is built by power sharing between the lecturer and student. The research results show that implementation of an asynchronous discussion forum in a Learning Management System enhances student collaboration thereby improving learning.

Keywords: Collaboration; Engagement; Online-Learning; Discussion Forum; Learning Management System.

INTRODUCTION

Recently, Bindura University launched a programme named Virtual and Open Distance Learning (VODL) as a solution to curb the economic challenge in access to higher education and delivery systems which deter many prospective primary and secondary level science educators from training at institutions of higher learning. Teachers from primary and secondary schools are enrolled at Bindura University for Diploma and Degree programmes in science subjects at different centers around the country. The teachers take their courses when on school vacation periods and payments are staggered round the year (<http://www.buse.ac.zw>).

With the launch of this programme, a lecturer is expected to take up a course for the group of conventional students who are on campus as well as off campus students who either visit the campus on a block release plan or the lecturer visits different centres. This poses a problem of inconsistency of the students' performance because many of them are having challenges travelling to the university in order to have access to learning resources in the library. A group of computer science students was used to experiment on introduction of a blended learning approach which in turn can serve as a recommendation to the distance learning programme.

A number of factors have been identified related to enhancing student engagement among online learners. These factors include flexibility of access to learning materials, learner control over the pace of study aimed at developing greater learner reflection. A discussion forum has been chosen in a Learning Management System in order to achieve one learner community where materials can be shared and knowledge is built by power sharing between the lecturer and student. A Learning Management System called Claroline has been implemented and this research aims at collection of information about the experiences of the students involved in use of the discussion forum; and analysing that information to discover the benefits, problems as well as the extent to which students will use the system for academic learning.

A discussion forum has been chosen as a tool in this case because of affordances such as its ability to engage in a dialogue, asynchronous communication tool, where someone posts a message and others read and post replies at a later time, resulting in building up of discussion threads over time (Alamro and Schofield, 2012). An online discussion forum is thus a tool that can be used to help students experience variation for blended approaches based on the idea that for learning to occur, variation must be experienced by the learner (Gerbic, 2010). A lecturer can set up, frame, moderate, lead and facilitate discussions allowing students to discuss, collaborate, reflect, argue, analyse and share information by communicative conversation with other students, lecturer or self by making use of a discussion forum (Jaffer et al., 2007). Deepest learning is in the writing and "talking" about the content of the course within the community of learners (Markel, 2001). Markel argues that:

"it is a pedagogically sound practice, based on cognitive learning theories, to design and engage in discussion forums with students providing more opportunities for students to become actively involved with the course content to construct their own deeper and lasting learning."

Reflecting on the current situation at Bindura University and analysing the research by Markel, a discussion forum is a useful tool that will promote student engagement and collaboration in order to build on knowledge and also to revisit the work at a time that is comfortable to them. This is also influenced by the affordances by Bower(2008) of the discussion forum such as repeat-ability where a student can work on one aspect as many times as possible to them, share-ability as an access control affordance where students are able to share ideas and also discussion forum accommodate asynchronous-ability reflection and interaction (Siemens and Tittenberger, 2009).

This research aims at ensuring that the students in these different settings are able to participate and work together in order to build on their knowledge by sharing resources in spite of the location that they are in so as to improve their performance. Through this study a lot of inconsistency in the quality of work produced is addressed. Also, the institution is relieved of the intense pressure that has mounted so far in trying to make ends meet with the shortage of human resources in teaching. Specific objectives of the study are to support collaborative work in blended learning by grouping up learners online, to assess the effectiveness of the discussion forum in a learning management system for facilitating online discussions among students and to assess the student's perception on the use of the discussion forum as a tool for interactive learning.

This study seeks to answer the following questions pertaining to introduction of a blended learning approach:

- 1) How do students benefit from other students' contributions and are they free to contribute to the online discussion forum?
- 2) How does collaborative learning in online environments lead to learning and acquiring of new knowledge?

BACKGROUND

Social-oriented learning theories such as Social Constructivism and Connectivism by resemble benefits of collaboration (Vygotsky, 1978; Siemens, 2005 cited in Chiong and Jovanovic, 2012). This yields to online collaborative learning as increasingly becoming an instructional choice in online learning (Chiong and Jovanovic, 2012). In this study, constructivist theory which provides a medium for conversing and collaborating within the learning environment was applied (Jonassen et al. 1999; McConnell, 2006). The constructivist approach views learning as an active process of building knowledge and skills through practice within a supportive community (Sharples et.al, 2005; Chen and Bryer, 2012) through the lens of Vygotsky pointed out that the basic principle in social constructivism is that students learn most effectively by engaging in carefully selected collaborative problem-solving activities under the close supervision of instructors. Vygotsky's idea of zone of proximal development as mentioned by Sharples(2006) is applicable in this research as students and the teacher can form a community which can help an individual student to develop. Mediation is possible where the more competent peer(s) is referred to as assisting performance bridging the gap between what the student knows and can do and what the student needs to know (Lorna, 2007).

In terms of the role of technology in transforming learning research has shown that much of the change in education over the last several decades has been defined by discussion of content rather than the model and process of learning design and delivery in a technology infused world (Siemens and Tittenberger, 2009). These scholars suggest different types of technologies and how they can be used in teaching and learning including discussion forums. Although the views of various social theorists differ, there is a general consensus that interaction,

dialogue, and collaboration are essential for productive learning (Nicol et al, 2003). Technology can provide a medium for conversing and collaborating within the learning environment (Jonassen et al., 1999; McConnell, 2006). Carliner and Shank (2008) articulates on how e-learning theory can inform designs of e-learning looking at the three theories and their respective instructional design. Constructivist theory deals with learner centered framework where the instructor facilitates learning rather than passing knowledge to learners and problem based learning where students learn domain-specific knowledge and skills in order to solve problems. The technology driven instructional design then aims at developing learning platforms that are deeply rooted in the learning theory in order to archive a technologically and pedagogically rich platform.

Shank (2008, p270) points out that:

“Whether in the education system or the workplace, technologies for learning change and are changed by those who use them and networks and the internet are continually providing new ways of teaching and learning that go beyond the traditional constraints of time and place.”

The researcher recommends that when discussing them focus should be more about methods to share support and collaborate.

Research has also shown that online discussion forums enable cooperative learning and results show that students who have opportunities to work collaboratively, learn faster and more efficiently, have greater retention, and feel more positive about the learning experience (Alamro and Schofield, 2012; Chiong and Jovanovic, 2012). The discussion forum is a public place for discussion that allows time for reflection. While there is a flow of discussion and it is linear, it is not subject to the tyranny of the ever present "now" of the face-to-face classroom that doesn't allow the participants the benefit of an "instant replay" (Poole, 2000). Although this suggestion is true, Poole further suggests discussion forums as allowing as many replays as a participant wants of what was said, which is an important affordance for this study's context. A discussion can be revisited and commented on as long as the discussion forum is open, while in a classroom, often the moment is lost and is difficult to revisit. Instructor response and student response are the key components to the construction of shared knowledge within the discussion forum and as deepest learning is in the writing and "talking" about the content of the course within the community of learners, this fits well into the context of the study. Also, it is a pedagogically sound practice, based on cognitive learning theories for educators to design and engage in discussion forums with students. This provides more opportunities for students to become actively involved with the course content to construct their own deeper and lasting learning, achieving a more student centered approach to learning. Hopperton (1998) noted that participation in online discussion forums provides opportunities for responsibility and active learning through the expectation of regular participation in online discussions.

Computer-mediated communication (CMC) which refers to asynchronous text-based communication that occurs through "one-to-one, one-to-many, e-mail-based discussion lists, bulletin boards" and computer conferencing environment interactions between computer users has emerged as an important research area in education, psychology, and technology domains (Hara et al., 2000; Romiszowski and Mason, 2004). There are numerous studies that support the idea that interactions with the instructor and other students are essential elements in a Web-based course (Fulford and Zhang, 1993; Picciano, 1998; Sherry, 1996). Rose(2006) cites Harasim(1989) describing interactivity as the most striking characteristic of CMC and the factor with the greatest potential to affect learning and Garrison et.al. (2001) describing a "virtual community of inquiry" which allows learners to construct experiences and knowledge through analysis of the subject matter, questioning, and challenging assumptions. In a face-to-face environment, this kind of reflection is often accomplished through synchronous, interactive discussions and problem solving sessions. The ability to ask questions, share opinions, or disagree with the point of view in a reading assignment is vital to student learning. In his article "The Emerging Online Life of the Digital Native," Prensky (2004) compared the internet generation to the generation that grew up in the age before the internet. He concluded that today's digital information communication-technology is an important part of a student's life; therefore "our students have changed radically. Today's students are no longer the people our educational system was designed to teach." Articulating that the innovation challenge is that today's student has spent most of their lives in the digital age processing information in new ways.

The most significant applications of computer-mediated communication in e-learning environments are asynchronous discussion forums (Kearsley, 2000). Web discussion forums provide a way for students to extend the classroom discussions and also provide better cognitive and exploratory learning (Haggerty et.al., 2001). Increased student-to-student discussion and cooperation, superior learner empowerment and upgraded critical thinking skills are key advantages that this research aims to achieve (Kassop, 2003; Stodel et al., 2006; Shapley, 2000; Collison et

al., 2000). Online discussions can play a critical role in Web-based learning by helping learners construct knowledge (Jeong, 2003). In an effective online forum, the discussion encompasses the principles of constructivism and social interactions to help learners reach new insights, knowledge, and perspectives. Principles that demonstrate realistic tasks, scaffolds, and feedback for acquiring skills and knowledge, and collaboration with peers will facilitate the process of constructing a shared body of knowledge (Jonassen, 1999). These outcomes may be best attained in the forum when appropriate scaffolding is provided within the students' zone of proximal development (Zhu, 1998, as cited in Hara et al., 2000).

However, empirical evidence to indicate that text-based communication used in computer conferencing can facilitate higher-order and critical thinking is only just emerging and not entirely consistent in its results. For instance, Garrison et al., (2000) report there is "limited" evidence that CMC can facilitate higher-order thinking. Other studies focus on learner-to-learner interactions in addition to the nature of those interactions (Collins and Collins, 1996; Ravits, 1997; Ward and Tiessen, 1997). These studies all reported that CMC can provide opportunities for more learner-to-learner interaction but also reported that CMC could facilitate more reflective and critical thinking skills.

Discussion forums can be ineffective for the learning process as Web-based communication technologies in the teaching/learning process may not necessarily guarantee critical thinking and effective learning and teaching and thus can end up as an open-ended, non-productive learning activity. This may suggest that just making discussion forums available does not result in its effective use.

CONTEXT AND METHODOLOGY

This study addresses issues to do with delivery of quality education to students in spite of their geographical location. Current research has mainly concentrated at self-sufficient online courses where the student is supposed to figure out solely how to learn without the teacher as a guide. With the increased numbers of learners in different locations, it has been increasingly difficult to provide one-to-one support and consultation. Also learning material is scarce and students who are staying on campus have better access compared to those off campus.

The study was conducted at Bindura University of Science Education. The researcher took a sample of computer science students as case study. The research also accommodated Virtual and Open Distance Learning (VODL) students off campus but can connect to the Learning Management System for the discussion forum. The students (both on-campus and off-campus) were enrolled to a course (Computer Architecture) on the Claroline Learning Management System which was hosted at a computer science intranet and form one group. All learning resources were uploaded on the Learning Management System. The educator who played the role of the instructor guided the students by posting discussion questions which had a lifetime of two weeks; this means that students would be given two weeks to post on a particular topic. Every student was required to contribute by making at least three posts on each task. As the students posted their contributions, they were also able to browse through contributions by others within the group and comment on other students' contributions either by asking more questions or by coming up with similar or differing points of view. The instructor was to make contributions to the discussion that directs the students back to the expected goal though the instructor had to make minimum contributions to enable students to generate their own knowledge (Romiszowski and Mason, 2004). After this each student took up a short multiple choice exercise which was used to rate whether the online discussion forum worked to improve their performance. The course sample was done using one instructor to avoid teaching differences. Forty (40) students were registered on the course and asked to join the online discussions. Thirty one (31) students were able to participate online, nine (9) students did not join the discussion forum. Students who access the discussion forum answered a questionnaire at the end of the course.

Sample Discussion Thread on Claroline Learning Management System

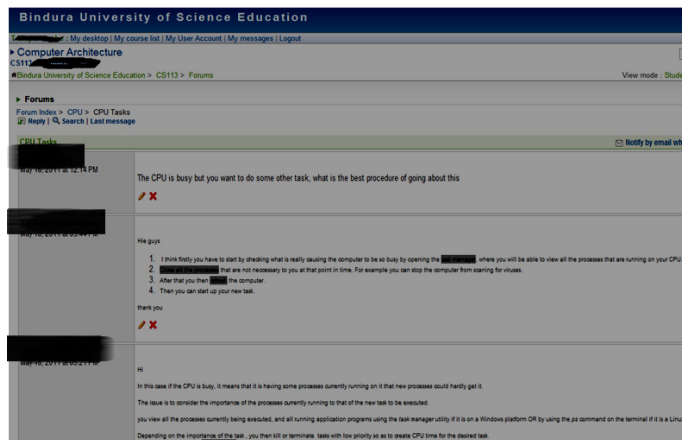


Figure 3: Taken from the computer science intranet– Bindura University Zimbabwe (names deleted for anonymity).

DISCUSSION OF RESULTS

On the different questions asked in the questionnaire the main components being tested were basing on the objectives of the research as follows:

- If they benefited from using the discussion forum in a Learning Management System.
- If they improved on participation and understanding of concepts by contributing to the on-going discussions.
- Ease of use (Whether the students liked discussing with others on the forum platform or whether they developed interest after looking at other students' contributions).
- Whether they support blended learning or prefer the traditional methods.
- If they used the internet to source for other schools of thoughts on a particular subject.
- Substitution of the contact sessions by the asynchronous discussion forum.

The results to the questionnaire were analysed based on the research objectives stated and the research questions that resulted from the objectives. The questionnaires requested for students' personal information only in terms of their age, sex and class (in terms of block release class or conventional class). Students' names were deliberately left out which promoted anonymity during the research. Several questions were asked with different question structures but testing on the same aspect in order to check if the student's response is consistent with accurate conclusions to be made.

- 1) Questions to check if students benefited from contributing on the discussion forum in a Learning Management System.

The first pool of questions had students' perceptions on testing whether the discussions were fruitful in building their understanding to different tasks as well as checking their interest in collaborating with other students on the discussion forum.

- a) The student responses showed that all of them were agreeing that their engagement and collaboration were enhanced by the use of the asynchronous discussion forum. As shown in the SPSS chart extracts below. 61.29% of the students strongly agreed and 38.71% agreed to benefit from the collaborations by other students.

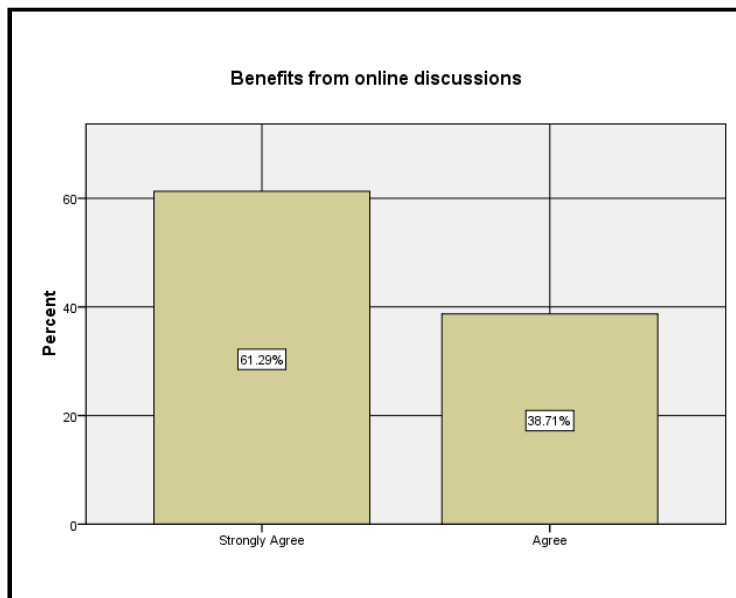


Figure 4: Benefits from online discussions.

The following responses were gathered from students who elaborated on their choice:

- “The discussion forum is a tool that can help students understand some concepts by sharing ideas despite one’s location.”
 - “I initially was not keen to post on the discussion forum, but on reading other students’ post I thought other peers would also benefit from my contributions.”
 - “It was a faster way of getting help from my peers than waiting for the next time I see them in a class discussion.”
 - “Agreeing to other posts and disagreeing to some would also make me learn more as arguments continued and others would elaborate and/or correct when a wrong post is made.”
 - “Class discussions are limited in making a person understand.”
 - “You can get corrected and can also check on other people’s responses before you can make yours so that there is no unnecessary repetition.”
- b) 25.81% of the students strongly agreed and 74.19% agreed on appreciating making discussions with other students and also making their contributions to building knowledge.

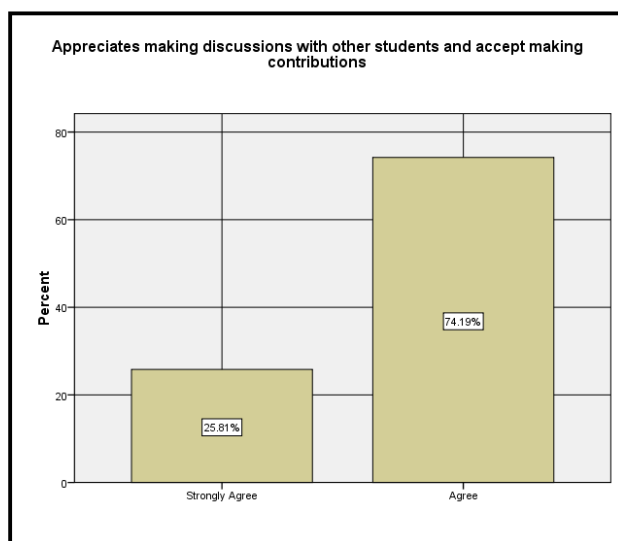


Figure 5: Appreciates contributing to the platform.

On these questions there was no response for the Neutral, Disagree or Strongly Disagree options on the questionnaire. On appreciating making discussions with other students and making contributions the following qualitative data was gathered as responses from most of the questionnaires:

- “Whenever I saw posts from my friends I get encouraged to post more so that my voice can be heard.”
- “I had to participate so as to get marks for the assessment.”
- “I think it’s easier to make a post than raise your hand in class at times.”
- “It was cool to feel that I am also contributing.”
- “Everyone has a chance to be heard.”
- “The ability of enabling students to use it at any hour of the day makes it more effective than traditional methods.”

In these two categories, students’ responses were in unanimous agreement that there was a lot of benefit from contributing to the group and students developed an interest of participating. As coined through the work of Sharples et al., (2005); Chen and Bryer, (2012) most students were in agreement that they built on their knowledge and skills through participating in a highly supportive community. Students appreciated participating and offering help whenever other students posted questions. The idea of sharing, feeling of benefit from contributions by the group members, and comparing other members’ view on a concept is highly evident in the questionnaire responses. Sharples’s(2006) notion of students and the teacher forming a community which can help an individual student to develop is also noticed. Tying assessment to the forum tasks also helped as an incentive to encourage students to participate.

2) Questions to check if students developed interest in use of discussion forum vs. supports blended learning:

a) Developed interest in use of discussion forum

- “The posts by the lecturer prompted me to respond, it was captivating.”
- “I especially liked the way we were welcomed to the group and the help we got in how to use the forum.”
- “Technology makes learning fun and contributing on the discussion forum to me is just like I am on Facebook with my friends.”
- “Learning a new thing always makes someone feel a lot of pressure at the start but once you get the jinx you are sure to post more frequently.”
- “At first I feared being humiliated by other students if I post something that is wrong but later as I saw other funny posts I became comfortable.”

- “I can say I have improved a lot in my contributions because this online group became more interesting and timely solutions can come from anyone on the group.”
- “The tasks posted by the lecturer were so engaging which made me more interested in researching more and participate.”

b) Supports Blended Learning

- “I like the mix of technology to the ordinary way of teaching.”
- “Every lecturer must do this, I now have somewhere to air out my views outside class.”
- “I could go through the discussions as many times as I wanted and every time I would do that I would get new meanings and better understanding of the concepts, when I go back to the lecture I would be better prepared.”
- “I no longer wait for lecture times to ask, help comes 24/7.”
- “Variety is the spice of life.”
- “This was a great way of lengthening discussions we had during lecture time which made it possible to get more detail on any concept that I needed more explanation on.”

Correlation Test

Table 1: Developed Interest in use of Discussion Forum, Supports Blended Learning

		Developed Interest	Supports Blended Learning
Developed Interest	Pearson Correlation	1	.645**
	Sig. (2-tailed)		.000
	N	31	31
Supports Blended Learning	Blended Pearson Correlation	.645**	1
	Sig. (2-tailed)	.000	
	N	31	31

** Correlation is significant at the 0.01 level (2-tailed)

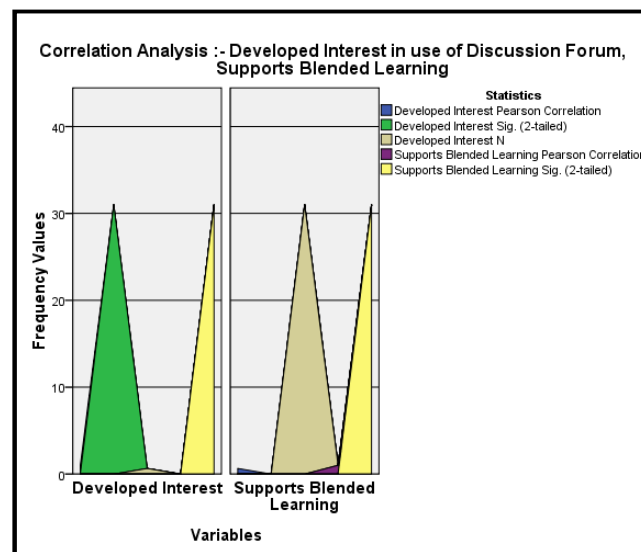


Figure 6: Correlation test result.

Pearson correlation of students who developed interest in use of discussion forums and support blended learning = 0.645

P-value = 0.000

The SPSS printouts indicate that the strength of association between the variables is high ($r=0.645$), and that the correlation coefficient is very highly significantly different from zero that is ($p<0.001$). Also we can say that 64.5% (0.6452) of the variation in developed interest in use of discussion forums is explained by student's support to blended learning.

Most students highlighted the advantage of having more lengthy discussions, being able to revisit the discussion threads for revision, evidence of student-to-student discussion, upgraded critical thinking skills, having variations in the way knowledge is delivered and the idea of blending traditional methods of education delivery with new ways by introducing technology. This is similar to the findings in previous studies (Siemens and Tittenburger, 2009; Jonassen et al., 1999; Poole, 2000; Stodel et al., 2006).

In this study similar responses has been noticed relating to students who developed interest in use of discussion forums also supporting blended learning. Students were keen to try out new technology as well as mix discussions on the online platform as extensions of classroom discussion.

CONCLUSION

Students showed significant learning enhancement over the course of the period that they used the asynchronous discussion forum. When students engage in sharing ideas by use of an asynchronous discussion forum, they build on knowledge together by collaboration and improve on performance regardless of geographical location.

The results show that blended learning which includes use of an online asynchronous discussion forum and face-to-face instruction will improve learner engagement and collaboration giving positive change in building up students' knowledge of different aspects of learning. Learners showed better participation and mostly everyone had a chance to make a contribution which is not the case in face-to-face only because of lecture time limits in this case, the face-to-face sessions are two in a week which run for two hours only for each session. The lectures are not always available and may be on one campus or the other when a student might need to communicate anything concerning the courses which make the traditional system a disadvantage.

Contrariwise,

"it cannot be assumed that simply providing teachers/learners with appropriate tools and task materials will result in their spontaneous engagement with contextual thinking.....the potential of computer mediation to foster knowledge depends less on what learners use, than on how they use it (Thompson, 1999)."

It may be possible that discussions on the online forum may end up getting out of context and students may overemphasise on the "lower order thinking" contributions as according to Bloom's taxonomy.

Also,

"If students are required to participate in asynchronous online learning, necessary steps have to be taken to ensure they are empowered with the necessary skills and tools to help them manage their own learning for their journey to become lifelong autonomous learners (Kaur and Sidhu, 2010)."

The research results show that integration of the asynchronous discussion forum and the face-to-face interactions may further improve engagements and collaboration of students. Students also emphasised of getting more help by use of other media integrated in the Learning Management System such as chat for real time discussions. By contributing to the discussion threads, revisiting threads for greater reflection, collaboration lead deeper learning of concepts. Students greatly benefited from their students' postings and improved in their level of contribution to the discussion forum.

As a result, this research can reflect the primary investigation that may need further study on the best way possible to harness blended learning in order to make it more engaging and collaborative. Other factors which also affected the way students participate including unavailability of internet access, high costs pertaining to use of public ICT centres and lack of instant feedback on an asynchronous platform can be further investigated.

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