The Impact of Asynchronous e-Learning Tools on Interaction and Learning in a Blended Course

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ABSTRACT

As an attempt to support the assertions made about the benefits of asynchronous e-learning tools in promoting students' interaction and learning in blended courses, this study aimed to investigate information technology students' perceptions of the impact of using asynchronous tools on enhancing interaction between students and the instructor, student and student and lastly students and the content. In addition, it sought to identify the challenges of using these tools and to provide suggestions to address these challenges. Semi-structured interviews and analysis of participants' emails and postings were prepared and implemented to collect data from participants.

As indicated by participants, the asynchronous e-learning tools had the power to enhance the three types of interactions through providing them with different resources and more time to express their ideas and thoughts. However, the lack of immediate responses, heavy workload, inadequacy of involvement and guidelines from the instructor, deficiency of students' commitment were considered as challenges that hinder the effective use. In the same time, participants offered several suggestions for addressing these challenges.
INTRODUCTION

Due to the introduction of information and communication technology (ICT), teaching and learning in the 21st century is changing fast. Therefore, it is important to design a learning environment that promotes student interaction, engages learners, enables changes, and moves them "towards an action state of goal attainment" (Wagner, 1997, p.21). Interaction is defined as "reciprocals events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another" (Wagner, 1994 p.8). The literature indicates that interactive instruction or 'learning by doing' has been found to result in positive learning outcomes and it is crucial in promoting academic success (Picciano, 2002; Watkins, 2005). More specifically, interaction serves as a purpose of increasing participation & motivation, developing communication, receiving feedback, enhancing elaboration & retention, supporting learner, discovery & exploration, clarifying misunderstanding, and achieving closure (Wagner, 1997).

Consequently, there have been a variety of technologies designed to support active interaction in learning. For example, asynchronous e-learning applications could promote active involvement among students who would be driven to be involved in the knowledge construction process or to be innovative (Driscoll, 2002). Moreover, it could develop critical thinking or deep learning through applied and reflective activities (Bransford, Brown and Cocking, 2000; Driscoll, 2002; Karl and James, 2006).

Asynchronous e-learning takes place when there is an interaction between instructors and students with intermittent time delay. Examples are self-paced courses taken via the Internet or CD-ROM as well as in mentoring online discussion groups and e-mail. More specifically, asynchronous e-learning includes variety of tools and applications such as email, discussion board, group work, social networks, groove, blogs, wikis, and podcasts. Such applications and tools have the potential to create environments where students actively engage with materials and "learn by doing" as well as refine their understanding as they build new knowledge (Johnston, Killion, and Omomen, 2005).

E-learning tools and applications have opened up new possibilities for combining learning with other life activities in ways that are optimally adopted to suit the needs and preferences of the students. The desirable characteristics of using asynchronous e-learning in traditional courses are mainly: flexibility, easy accessibility, and cost-effectiveness. In terms of flexibility, e-learning technology can provide an interactive environment whereby students may contact each other, share information, ask questions, and test their own abilities without any barriers. Furthermore, each student may work with the teaching materials according to his/her own abilities or level of knowledge and can practice as much as possible. Students with different levels of knowledge and abilities should not cause any interference in each other's progress. Whereas accessibility ensures that materials are easily accessed anytime and/or anywhere with a computer and networking technologies at the students' convenience. In addition, there is a wealth of evidence which suggests that e-learning can make learning activities more cost-effective and efficient, by eliminating time and location-based constraints which tend to affect traditional types of learning.

Although the blended learning approaches that integrate e-learning components into traditional classes have continued to grow rapidly, it is still at an infant stage of development where the challenge of internalizing such knowledge requires significant amount of time, effort, and planning. At the same time, there is a lack of evidence to support many of the assertions made about the benefits of asynchronous e-learning tools in promoting students' interaction and learning in blended courses. Thus, researchers, administrators,
and instructors need more understanding of how students perceive and react to elements of e-learning applied to enhance teaching and learning in traditional classes. Moreover, focused efforts are needed on how best to apply these approaches which can effectively enhance learning and improve achievement (Koohang and Durante, 2003).

In contributing to the body of asynchronous e-learning research literature, this qualitative study investigated information technology (IT) students' perceptions of using the electronic mail (email), web log (blog), and discussion board (DB) as asynchronous tools for enhancing their interaction and learning; it also evaluates the challenges of integrating these tools and how to address such challenges.

THE PURPOSE AND SIGNIFICANCE OF THE STUDY

The present study sought to investigate the major question, "Do asynchronous technologies (email, blog, DB) enhance interactions; student-content, student-instructor, and student-student, and to what extent it affects their academic achievement?"

The feedback from students provides the instructor with the opportunity to improve his instruction techniques, and assess the different aspects of the course to support and facilitate learning. Thus, a clear understanding of students' perceptions regarding asynchronous technology will help instructors to create meaningful e-learning activities and tasks that meet the learning needs and interests of learners. It will also help them to improve the strategies that will provide guidance and instruction for individuals and student groups. In addition, the findings of the study will provide a contribution to the extension of the literature of e-learning interactions.

THE RESEARCH QUESTIONS

1. How do students view the use of asynchronous e-learning tools in enhancing their interaction with their instructor, peers, and instructional content?

2. What types of asynchronous e-learning tools do students prefer to use to interact with their instructor and peers?

3. What kind of challenges do students perceive when using asynchronous e-learning tools as interactive and collaborative learning tools?

4. What do students suggest to improve the methods in which asynchronous e-learning tools are used to enhance their learning?

LITERATURE REVIEW

E-learning is defined as an innovative development in education that uses ICT to improve teaching and learning, and promote educational interaction between instructors and students (Ishhaiwa, 2006). There are two primary modes of e-learning instruction: synchronous (instructor-facilitated) and asynchronous (self-directed, self-paced). Instructions can be delivered by a combination of non-interactive methods: learning portals, CDs, DVDs, hyperlinked pages, streaming audio/video, podcasting and live web broadcasts as well as interactive methods like threaded discussions, emails, blogs, chats desk-top video conferencing and many more.
Specifically, asynchronous applications can be used for reflections on lectures or presentations given in class, continuation of classroom discussions, commentary on questions not dealt with during class sessions, case study discussions, scenario discussions, discussions of readings or articles assigned for additional reading and reflection, questions and answers about processes, procedures, assignments, activities, lectures, and forums for sharing personal ideas, thoughts, and experiences related to the topics, activities, lectures or assignments happening in class (Ishtaiwa, 2010).

A literature review of the elements that contribute to high-quality of e-learning activities revealed that making the best use of the available technologies to support interactions is one of these factors. Interaction is a powerful facilitator for learning, and there is a relationship between the amount of interaction students have with course content and their performance. Thus, some researchers indicate that interactions are one of the main concerns of designers of e-learning activities (Heffner & Cohen, 2005; Schrum & Hong, 2002). According to Muirhead (2004), a major challenge for instructors involves creating a consistent level of interaction that fosters genuine learning and cultivates a community atmosphere. This will require developing strategies that provide guidance and instruction for individuals and student groups such as deciding the amount and frequency of feedback provided on student work and dialog comments.

Three types of interactions were initially identified, student-instructor, student-content, and student-student (Moore, 1989). The student-instructor interaction which transpires between students and faculty is intended to help reinforce student's understanding of the material or elucidate meanings (Thurmond, 2003). According to Moore (1989), student-instructor interaction was a key that motivated students to learn, maintain and enhance students' interest in any subject matter. Since many students might be new to e-learning, teachers would need to develop strategies that will validate students' current academic development while helping them to pursue their professional and personal goals. This requires teachers to create a class structure that would stimulate social interaction and promote independent learning skills (Jaffee, 1999). Obviously, the amount of teacher's involvement could vary from one educational context to another because the learning process would be a dynamic unit that would transcend any exact formula.

Swan (2003) has argued that online course environment could contribute to more effective communications between both instructors and students. As an example, students' behaviors could be apparent through text messages which have allowed them to express their concerns and views. Moreover, in a qualitative study by Brower (2003), the findings suggested that quality classroom discussions not only was emulated using electronic bulletin board technology, but also went beyond the advantages of a regular classroom discussions. In this regard, Frey, Yankelov, and Faul (2003) have conducted a study to monitor 18 instructors on e-learning courses. The findings revealed that the instructors' initiated activities such as posting assignment directions, lecture notes, grades and use of e-mails and bulletin board to communicate with the students were the five most valued tools accessed by students. In another study carried out by Perreault, Waldman and Alexander (2002) entitled "Overcoming barriers to successful delivery of distance-learning courses", they have indicated that e-mail for lecturers' notes and assignments were used heavily not only by faculty but also by students. It was considered by both that the technology have caused the highest increase in their productivity. This implies that instructors should seek students' involvement in the course by creating interesting discussion topics and high-quality designed interaction activities.
The student-content interaction is the interaction that results from students examining and studying the course content. The focus is on the understanding and perspectives that students gain from the knowledge they construct while interacting with the content (Thurmond, 2003). Students frequently learn new concepts and then apply them to new situations. Active engagement in learning could involve the student as an active rather than a passive participant in the learning experience. Content design should include mechanisms that provide means for students to self-test their mastery of materials such as recognizing patterns and drawing conclusions (Abulibdeh, 2009).

Student-content interaction can be impacted by a kind of media used for instruction. It is, therefore, important to determine not only the types of media used but also the combination of the media employed. Jensen and Falahey (2002) have declared that in order to learn, students must have a meaningful interaction with the content and the content must be presented in such a way that students could be motivated and inspired to think critically. Although student-content interaction is well recognized as a type of interaction, there is not much discussion about student-content interaction in the current research literature. This is probably because different contents may require different interaction patterns, and thus, it is difficult to have a generalized discussion about such interaction (Su et al., 2005).

The third type of interaction, student-student interaction, is defined as an interaction between one student and the other students, with or without the real presence of the instructor (Thurmond, 2003). Studies in this area have pointed out the importance of peer interaction, particularly at the stage of application and evaluation of new content (Moore, 1989). Researchers have proven that given an adequate opportunity to participate in online discussions would offer benefits in the form of greater social interaction with other class members (Biesenbach-Lucas, 2003, Ishtaiwa, 2010).

Another study conducted by Kelsey and D'souza (2004) has revealed that student-instructor interactions were important to both instructors and students. With regards to student-content interactions, students were found to be successful in using the various technologies to meet their learning needs. However, student-student interactions were considered the least important for success and the least important for both students and instructors since they did not ask for student-student interaction.

In terms of studying the benefits of using asynchronous technology in enhancing students' interaction and learning, Robert and Dennis (2005) have theorized that asynchronous communication could increase a person's ability to process information. The receiver could have more time to comprehend a message because an immediate answer was not expected. This argument was also supported by a research study done by Hrastinski (2008), where it showed that students might spend more time refining their contributions which were considered more thoughtful as compared to that of synchronous communication.

In their study, Brewer and Klein (2006) investigated the effect of the type of positive interdependence (roles, rewards, roles-plus-rewards, no structure) and affiliation motives (high vs. low) in an asynchronous, collaborative learning environment. Results indicated that participants in groups given roles plus rewards interacted with their teammates more significantly than those given rewards only or no-structured-interdependence conditions. A significant positive correlation suggested that participants with higher numbers of interactions attained higher posttest scores.
In another study involving 300 students working during six months in 38 electronic discussion groups, Schellens and Valcke (2006) examined whether collaborative learning using asynchronous technology enhances learning academic discourse and knowledge construction. The results confirmed that students in the discussion groups are very task-oriented and that higher proportions of high phases of knowledge construction are observed. Significant increases in the cognitive interaction, task-orientation and higher phases of knowledge construction were detected showing that group size is a significant interaction variable.

In his study to describe the use of asynchronous technology in online classes, Newberry (2005) has highlighted that students still tended to use emails as the primary communication tool for direct interaction with their instructors. Emails are more efficient for one-to-one communication with the instructor, as well as with other students.

Similarly, Ishtaiwa (2010) explored students' perceptions of asynchronous discussion board (ADB) as a tool of learning. The results indicated that the participants perceived ADB as an important and interesting learning and communication tool because it helped them to access, explore process, communicate, and apply information in ways that are radically different from face-to-face-based pedagogies.

Based on the prior literature review, it is evident that asynchronous technology has the potential to enhance interaction and improve students' academic success. It also affirms the central role instructors play in creating a dynamic and academically effective e-learning environment. The key to success in e-learning activities rests not in the content that is being presented, but in the method by which the content is being delivered (Palloff & Pratt 2001). However, it is critical to know how this improvement can best be realized and achieved. Students can provide valuable insights by describing their perceptions of the impact of asynchronous technology on interaction and learning that might lead instructors to create more effective e-learning activities.

**RESEARCH CONTEXT AND PARTICIPANTS**

The present study was carried out at Al Ain University of Science and Technology (AU) in the United Arab Emirates (UAE). Like other universities worldwide, public and private universities in the UAE are becoming more engaged in the new technologies as they strive to get international accreditation so as to be more competitive in the global market. AU is among the universities that aim to embrace e-learning in teaching and learning in each of its programs, where the students are becoming more actively engaged in the learning process in order to produce workforces that are educated, skilled in new technologies, and able to face global challenges.

As a response to the encouragement from the AU administration to faculty members to utilize modern technology in their teaching and learning process, this study was conducted at the Faculty of Education. The Faculty aspires to be a leader in the preparation of prospective teachers and educational leaders, through emphasis on active learning rather than traditional teaching, as well as through research, technology, clinical processes and collaboration with local schools and educational establishments in the UAE. For example, the program of professional diploma in teaching aims to help teachers who have a bachelor degree from faculties other than the Faculty of Education itself to obtain professional preparation. This goal is congruent with the Ministry of Education directions that all teachers should have professional preparation.
The investigation covers all IT students (n = 46), who were registered in the program of professional diploma in teaching during the second semester of 2010-2011. Three types of asynchronous e-learning tools were added as additional components into two sections of methods of teaching information technology course (EDU 537) over 14 weeks, including the discussion board, the web log, and the email. In addition to the weekly face-to-face class meetings, students were requested to use these tools collaboratively or individually for discussing course content, generating questions, replying to questions, uploading course materials, and providing links to related websites. The goals of the previous blended design were: enhancing students' learning and achievement by fostering interaction and collaboration among students, contributing to a critical understanding of course material, and providing a platform where mutual support and social cohesion could develop. Thus, it was hoped that online discussions would be able to "empower the students and encourage them to take on the role of critic and inquirer" (Scarce, 1997).

In sampling participants for the study, ten female information technology students were selected randomly using a list of students' names registered into the two sections of EDU 537. Then, they were personally contacted by the first researcher to request participation. All selected female students accepted to participate in the study; however, the only one male IT student who was registered in the class refused to be a part of the study.

The course instructor prepared the students to use the three asynchronous tools. The email was illustrated through Gmail, blog through Google Blogger, and discussion board (DB) through Share Point Learning Management System. The instructor created a special email, blog, and forum for the class. While having no difficulty in using the email, the participants needed extra effort learning the use of the different capabilities and functions of DB and blog tools. The three tools were mainly adapted for allowing students to generate questions and responses, read instructor's and other students' responses, work collaboratively and independently, provide links to different websites and sourced information, and engage in student-student, student-instructor, and students-content interactions.

During the study period, participants were required to use the three asynchronous tools to post questions about topics covered in the class, post questions about topics of interest not sufficiently covered or not covered at all, post adequate responses (five sentences) to another student's question, respond to instructor's questions and course related issues. The structured nature of the assignment was to facilitate a productive social interaction by ensuring that the participants engage in in-depth discussions rather than random postings (Ajayi, 2009). Thus, participants were required to meet specific requirements as described in a set of guidelines and an evaluation form which were distributed at the beginning of the semester. These guidelines can be summarized in the following:

- Contributions should be reflections of the course content.
- These contributions need to include reflection of critical thinking, not mere description or summary.
- Each student is expected to send at least three messages per week using the three tools.
- A message needs to be a reaction to previous messages (Biesenbach-Lucas, 2003).

The instructor's role included responding to students' questions, giving feedback, providing additional ideas and concepts, in addition to evaluating each student's message based on the above criteria. All the emails, ideas, thoughts, responses, comments, and threads were available to the students to view throughout the semester.
Data Collection and Data Analysis

Two different sources of data were used to collect information needed to answer the research questions. They were semi-structured interviews and analysis of participants' emails and postings on the course DB and the course blog. Interviews were employed to obtain in-depth perspectives, personal stories, and personal contexts of the participants. Students' emails and postings were used to support the findings of the interviews by identifying what students did and what they valued. The interview questions were developed from the literature review, research questions, and the researchers' experience in the field. They dealt with the following areas of inquiry:

- Students' views of email, DB, and blog as communication tools to enhance interaction and learning;
- Types of learning opportunities afforded by asynchronous e-learning tools;
- Students' views of the applied methods and techniques in which asynchronous e-learning tools are used;
- Advantages and drawbacks of asynchronous e-learning tools, and;
- Suggestions for modifying the use of asynchronous e-learning tools.

After developing the interview questions, it was submitted to a panel of experts to judge the questions quality and adequacy for answering the research questions. Based on that review, two questions were rewritten, three items were added, and one item was deleted. In addition, the researchers interviewed three students who were not participating in the actual study. Questions and comments raised during these interviews helped the researchers to further clarify the intentions of the study, and the wording of the questions. This process was valuable in improving confidence that the interview questions were easy to understand, and would generate data congruent with the purposes of the study.

Interviews with the participants took place in the first researcher's office during the last week of the semester. Each participant was interviewed by the researchers for 43 - 62 minutes session. The substantive phases of data collection were audio-taped and transcribed in Arabic in which the participants communicate. Recording interviews assured having the most complete record of what was said as advised by Hitchcock and Hughes (1995). A secondary data source for this study was analyzing all students' emails and postings that included the posted questions, answers and comments for the semester.

The data drawn from responses to interview questions and the content of the participants' emails and postings were analyzed within the framework of verbal analysis method developed by Chi (1997). Verbal analysis is a coding and analyzing method for spoken and written data. Initially, the data are transcribed, before being "segmented" into utterances, sentences, or other appropriate portions. These segments are then investigated qualitatively, and the trends, impressions and patterns that emerge are used to develop or modify an initial coding scheme. Then, this coding scheme is used to categorize all of the data segments, and finally quantitative analysis is used to describe and analyze the results (Chi 1997). In such an approach, students' utterances are segmented based on semantic features such as ideas, concepts, argument chains, and topics of discussion. In the present study, the participants' responses were segmented and then coded according to the meanings they expressed such as (perspectives, knowledge construction, independent learning, interaction, satisfaction, effectiveness, and obstacles).
RESULTS OF THE STUDY

This study examined the IT students' perceptions of asynchronous technology as a tool to enhance interaction and learning through answering four specific questions. Therefore, the results are first presented according to these questions followed by the discussion of the general themes that emerged from the data analysis.

Perceptions of Asynchronous E-learning Tools

When asked about how students view the use of asynchronous e-learning tools in enhancing their interaction with their instructor, peers, and instructional content. Participants provided mixed views about the role of asynchronous e-learning tools in enhancing interaction. Six participants (60%) mentioned that they enjoyed using asynchronous tools and found them helpful to enhance the three types of interactions (student-instructor, student-student, and student content). They also indicated that asynchronous discussions helped them to access, explore process, communicate, express ideas and thoughts, as well as apply information in very encouraging, interesting, and innovative behavior. This finding was evident in the participants’ typical responses, such as:

• “One of the biggest strengths of asynchronous online discussion tools is improving my understanding of the course content through fostering true interaction with my professor, peers, and content. I think these tools are fantastic to create an individualized instruction that meets my needs.”

• “Before this class, I used emails to contact others; however, it is the first time to use the online discussion board and the blog. These tools are just amazing in terms of enhancing my learning. For example, posting a good contribution as required by the instructor required me to review other postings and course reading. In addition, in some cases I needed to use one of these tools to contact the professor or my peers to ask about some issues. In my opinion this dynamic process helped me to understand and remember much more information.”

• “Asynchronous e-learning tools offer many possibilities of what I can do. For instance, if I didn't understand something during the class session, it is very easy and comfortable to get answers and explanations from the postings on online discussion board or the course blog. Another way is emailing the instructor or one of my peers to ask about what I have missed without fear or shyness of wasting the class time. This technology allows me to access a lot of resources that make my learning more fun, enjoyable, and interactive.”

Three participants (30%) expressed that asynchronous technology helped them to enhance their interaction with the instructor and the content. However, it did not significantly impact their interaction with peers because of some students' poor commitment to participate, negative attitudes, and lack of time to communicate and interact, as indicated by one of the participants saying “By using asynchronous tools, I’m a more active student. Its major advantage is providing access to an enormous amount of information that forced me to think more deeply before posting my answer, idea or comment. In addition to this great advantage, my professor was always there to answer my questions. So I did not feel that there is a critical need to email or contact my classmates.” Another participant stated that: “During the semester, the instructor kept encouraging us to interact with each other using asynchronous tools. Consequently, I posted a question to my peers on the class discussion board. When I did not get an answer, I emailed them the question, and after three days, I got just a single short answer. I think that many students are not well prepared or keen to use such tools.”
One participant (10%) pointed out that asynchronous technology was helpful only in enhancing her interaction with the instructor. Particularly, she expressed the significance of using the email to interact effectively with the instructor: “What I really like about asynchronous format is providing me with the opportunity to email a question or an answer to my instructor. Actually I prefer to write my response more than saying it in front of my classmates. When I write, I can write at any speed I want, I can also correct myself while I’m writing. On the other hand, I did not respond to my classmates’ questions and thoughts because reading their postings and emails and responding to them requires too much effort and time.”

During the interviews, participants were asked about their willingness to use asynchronous technology in other classes. The majority of them (80%) indicated they would like to see asynchronous tools used in their future courses. They mentioned that asynchronous tools have a number of educational benefits, most notably is promoting collaborative learning that can lead to developing effective learning communities. More specifically, these tools provide a combination of interaction and reflection through allowing students to engage in sophisticated discussion. The asynchronous format allows students to take time to make sense of others’ ideas and thoughts and then to formulate their own responses.

Another benefit of asynchronous tools mentioned by participants is that each student was able to engage in discussions and respond to questions. Asynchronous format is a great tool especially to hear those who are reluctant to speak in face-to-face classes. A participant summarized her willingness to use asynchronous technology in the future: “I do like these great tools. I would like to use them in my study in other classes and in my teaching in the future. Asynchronous tools enabled me to review class materials and participate in reflective discussions with others at convenient times.” Another participant said: “Asynchronous tools have a lot of advantages for all students. Usually, I hate to speak in front of my classmates. These tools enabled me to ask questions about issues being studied, share my work with other students, and engage in group work outside the class. The process of writing responses helped me understand what I learn. In addition, since replies and contributions can be archived, it helped me access and read postings of others at any time even after the discussion is over.”

**Perceptions of Preferred Asynchronous Tools**

When asked about what types of asynchronous e-learning tools students prefer to use for interacting with their instructor and peers, Participants consented that the most preferable and beneficial asynchronous e-learning tool was the email followed by the blog then the DB. They preferred the email because it is available, easy, fast, and private. Here are some selected samples of the students’ responses regarding their preference of using email as an interactive and communicative tool:

- “The class blog and the online discussion board are important tools to interact and communicate with your peers and the instructor, but the email is the most efficient and effective way to stay in touch with them. You can send a message to one person or all of them in a fast easy click.”

- “In this class, it was the first time I use the blog and the discussion board as communication and interaction tools. In fact, these tools are very effective for sharing ideas and thoughts. In addition, it allows you to see how other students feel and think of a particular topic. However, I feel more comfortable in using the email more than any other communication tool.”
• “Each tool has its own advantages, but I cannot share the private questions if I don’t have email. I prefer the privacy of e-mail especially to contact my instructor.”

• “At least for saving time to get what I want, I’d definitely prefer to use email to communicate with my instructor or a classmate.”

In terms of the comparison between the DB and the blog, nine participants (90%) favored using the blog over the DB. Although participants held positive views towards the DB as a tool to enhance their interaction and learning, they felt more convenient and willing to use the class blog than using the class DB to participate and interact with their instructor, peers, and the posted content. This finding was supported by the amount and length of students’ contribution to the course blog. Although students were requested to contribute to both the class DB and the blog, students’ postings were significantly bigger and longer on the blog than those postings on the DB. The main reason behind this preference lies in the students’ ability to access the course blog no matter where they are, while students had to be on campus to use the DB because the Asynchronous Board was connected to the Intranet not to the Internet.

Some of the participants, in their responses to the interview questions, said:

• “Both the course blog and discussion board were great tools to motivate me to work with others, contribute to assigned discussions, and share thoughts and ideas freely. But I like the blog more because I could use it whenever and wherever.”

• “I do realize that reading other students’ work will enhance my understanding and achievement. However, I never had the time to read all posted questions and answers during my presence on the university campus. Being able to access the course blog from outside the university is a big advantage.”

• “In most cases, I used the blog to post my own answers; I got positive feedback from my instructor. To be honest, I used to read others’ answers before posting mine. At the same time I used to delete my contributions on the discussion board quickly before going home. I suggest connecting the discussion board to the Internet as it will give us more time and flexibility to participate.”

• “Among the advantages of using asynchronous e-learning tools is providing me with different opinions, thoughts, and perspectives of the assigned topics. This in turn helped me to think differently and more critically. The Google blog is a fabulous, lovely, and wonderful tool.”

**Challenges of Asynchronous Tools**

When asked about what barriers and challenges that prevent asynchronous technology from being more powerful, interactive, and collaborative learning tools, the participants reported different categories of challenges. They included: Lack of immediate responses, heavy extra workload, deficiency of students’ commitment, and inadequacy of involvement and guidelines from the instructor. First, while participants reported that the extended time provided by the instructor is an advantage to write critical and intellectual responses, 60% of participants felt frustrated as a result of receiving slow responses to their questions or requests for clarifications. These participants recommended that finding ways to provide them with immediate feedback will enhance the effectiveness of asynchronous technology and applications. The following are some obvious students’ responses explaining in details the previous challenge.
• "In many cases, I could not ensure the clarity and accuracy of my own postings, or understand others because some students never responded to my posted messages."

• "Unlike the traditional class discussion, I used to wait for a long time before someone actually responded to my urgent queries. It should be a way to solve this frustrating situation."

• "The lack of immediate feedback from the instructor and peers creates a big barrier for the effective use of asynchronous tools. Asynchronous format is a fantastic way to receive some clarification on some unclear ideas. Yet it is possible and normal not to receive any response on some ideas that you wish to understand."

• "In my opinion as a student who believes in the significance of asynchronous discussion, I think setting a specific time by the instructor for responding is a good way to improve the use of asynchronous tools."

Secondly, 50% of participants indicated that adding asynchronous tools to the course increased their workload. The extra workload included time and effort for reading, summarizing, and typing postings. One participant gave a good description of how doing asynchronous discussion increased her workload: "Although there was no specific time for posting within the discussion period, I was not able to respond effectively because I did not find enough time necessary to read the numerous, and disconnected comments posted by peers. Time and effort were needed to read, summarize, and type responses. I had other requirements for this course and other courses. Actually, I had a lot to do other than online discussions."

Thirdly, 40% of participants cited that other students' poor commitment presented an important challenge, as they said that they used to read the same idea many times because some students tend to copy what other students have said without giving their own opinions. The analysis of students' postings supported this finding where the same idea is being written repeatedly. One participant described this issue "The negative characteristic about asynchronous discussions was reading the many disconnected and repeated messages. Some students just cut and paste other messages rather than spending time on building their own responses". Another participant pointed out that "reading a sample of students' postings will help you tell that some comments are irrelevant and make no sense. Unfortunately, students were posting for the sake of participation or for the sake of grades."

Finally, some participants complained about the inadequacy of guidelines from the instructor where they indicated that 30% of participants considered that the guidelines offered by the instructor were not sufficient to perform effective and efficient online activities. At the same time, they noted the inadequacy of instructor's involvement especially when students got disoriented in the online discussion. One participant explained: "Since this was the first time to integrate asynchronous tools in our learning process, then there was a critical need for concrete and detailed guidelines for successful integration of asynchronous technology in teaching and learning. Guidelines were needed in term of what we post and how our postings will be evaluated." Another participant said: "Sometimes, online discussion was frustrating because many students were talking to other people at the same time. This resulted in many different ideas and sub-discussions which made it difficult for us to follow these multiple discussions. I think instructor's involvement in this case was important to solve this problem, and prevent students from getting disoriented."
Modifying the Use of Asynchronous Tools

When asking participants about their views of the applied methods and techniques in which asynchronous e-learning tools are used to enhance interaction and learning of this course, they considered the way of incorporating the three asynchronous tools as an effective and efficient way to raise their level of interaction with the instructor, peers, and the course content. Most of participants (70%) concluded that they welcomed the criteria used to guide and evaluate their contributions to class asynchronous tools. As mentioned earlier in this paper, students were required to meet specific requirements as described in a set of guidelines and an evaluation form which were distributed at the beginning of the semester. The following quotations explain participants' appreciation of those criteria and guidelines:

- "Although I profusely use technology applications such as Facebook, Youtube, and Twitter for social interaction and communication, in the beginning of the class, I hated the idea of using email, blog, and discussion forum for educational purposes. But being required to post three messages per week as part of the coursework forced me to use them to ask questions or respond to others' questions, and sometimes post useful links. As a result of gaining benefits of using asynchronous tools as a student, I will ask my students to use them when I become a teacher."

- "Asking us to post a reaction to previous messages and notes is exhausting. It needed a huge amount of time and effort. Nevertheless, this requirement led me to have critical reflection and deep understanding."

- "Each student is required to participate and contribute to the class discussions. This means that there won't be few confident students who typically dominate face-to-face class activities. All students will benefit by hearing the opinion of others. As a matter of fact, I read some opinions of students who have not spoken in the classroom at all."

Moreover, participants in this study offered several suggestions to improve the effectiveness and efficiency of asynchronous format as educational tools for enhancing their interaction and learning. First of all, nine participants (90%) suggested that providing more specific and detailed illustration of e-learning assignments and their length might make these activities more powerful and beneficial. For example, many participants complained of lack of specific guidelines regarding the length and nature of postings. A participant explained her opinion: "In most cases, our professor did not specify the length of required answers and responses. As a result, I got confused, should I write a lot to ensure getting complete credit or write a little to decrease the time of typing and reading messages?"

Secondly, seven participants (70%) recommended concentrating on discussing particular and precise issues because asking them to post about general topics did not lead them to demonstrate high level of critical thinking and effective learning. One participant pointed out: "I welcome the idea of using asynchronous applications to support traditional face-to-face classroom teaching and learning. However, just implementing such applications does not ensure the desired results. Using this type of technology requires accurate and careful planning. In this regard, I can say that defining specific issues to be discussed via asynchronous technology is more beneficial than general topics." Similarly, another participant noted: "Writing about specific issue forced me to think more critically and in different ways before posting my answer. This thing cannot be achieved when I post general ideas, because our lecturer will accept and consider it as correct answer."
Thirdly, sex participants (60%) suggested that providing detailed guidelines for postings evaluation (e.g. clarity, creativity, coherence, definition, reverence, variety, and writing mechanics) will help them to post more concrete and valuable responses. In this regard, participants also noted the importance of rewarding the good postings as well. This in turn will encourage them to focus on quality rather than quantity of postings.

- “It is not enough to know how many postings I am expected to post; it is substantial to know how my postings and responses will be evaluated.”

- “As the instructor required us to read our peers’ messages, in many times I was reading the same message over and over. On my behalf, I can say that some students posted just for getting the credit of posting. Providing clear criteria for posting and evaluation will reduce the repetition and increase the quality of postings. It will help us to write better responses by showing us how our work will be evaluated, and give us the opportunity to judge and revise our work before posting it.”

- “As a part of evaluating postings, I suggest asking students to distribute a number of postings on different topics rather than focusing on one topic of interest. Variety of postings will enrich the value of using asynchronous tools.”

- “Posting for the sake of posting will not lead to effective results, rather to achieve the promising results students should be asked to present their ideas and opinions in clear and coherent construction, and to support these postings opinions with strong evidences. In addition, students should be asked to pay attention to effective writing skills. A very important point is rewarding the posters who meet the previous criteria.”

- “Since we get the same grade whatever we post, there is no need to spend long time and exert huge effort on formulating my response. However, rewarding me on the good posting will motivate me to do better and better.”

Finally, four participants (40%) requested deleting the irreverent and repeated comments since it can easily distract students and waste their time. They concluded that there is a high probability for a certain topic to lose focus because of many side discussions. A participant expressed her feeling of this issue saying “We were asked to post a message as a reaction to previous messages. This request has positive and negative sides. While it allowed us to hear different perspectives and opinions which opened new gates for us to build our messages, it bored us and wasted our time through reading irreverent and repeated messages over and over again. I think there should be a way to delete those distracting messages.”

DISCUSSION

The aim of this research was to explore the impact of asynchronous e-learning tools on interaction between students and instructor, student and student, and students and content. The research also aimed to identify the advantages and challenges of using them, and to modify the methods in which asynchronous e-learning tools are used. Based on conducting interviews with ten IT students pursuing professional diploma degree, and analysis of students' postings as well, some notable themes could be seen across the responses. These themes will be further explored.
In this study, 60% of participants indicated that using asynchronous tools enhance the three types of interactions (student-instructor, student-student, and student content), 30% expressed that asynchronous tools helped them to enhance their interaction with the instructor and the content, while 10% pointed out that these tools were helpful only in enhancing their interaction with the instructor. The participants' self-evaluation of the impact of asynchronous tools indicated that these tools could contribute to more convenient, effective, and efficient interaction. As explained by one participant: "it is very easy and comfortable to get answers and explanations from postings on the online discussion board or the course blog. Another method is emailing the instructor or one of my peers to ask about what I have missed without fear or shyness of wasting the class time."

Unlike the face-to-face teaching where a student with greater social presence may dominate the discussion, the nature of asynchronous tools allows all voices to be heard. Even those students who may be intimidated by speaking in front of their peers, or those who need more time to respond are easily able to express their thoughts more freely and descriptively. Text-based communications may enhance interactions through removing and diminishing barriers of participation such as speaking or communication skills, cultural differences, and shyness (Berge & Collins, 1995).

In addition, participants indicated that asynchronous tools enhanced their deep learning and understanding of the course topics due to the larger amounts of time for reflection. Asynchronous format provides a combination of interaction with reflection through allowing students to engage in sophisticated discussion. One participant described this issue: "Now, there is ample time for reading others' ideas and thoughts, making sense of what they said, then coming up with your own response." The absence of time constraint gives participants more time to think critically and in different ways, as argued by the following participant: "since other's postings can be archived, it helped me access and read an enormous amount of information at any time even after the discussion is over. This allowed me to think more critically, deeply, and differently."

The electronic email was found in this study as the most preferable asynchronous tool to communicate and interact with the instructor and peers. This result could be due to the deficiency or slowness of peers' responses to their posted questions or queries. One participant explained that: "In many cases, I could not ensure the clarity and accuracy of my own postings, or understand others because some students never responded to my posted messages." The deficiency or slowness of getting responses from peers posted on the class blog or DB may also explain why students preferred email rather than other e-learning tools.

Students liked the email because it is always available, easy to use, quick and private. In this regard, 90% of participants favored using the blog over the DB. The amount of postings on the class blog was much bigger and longer than postings on the discussion board. Participants justified this preference by the ease and ability to access the course blog no matter where they are located. Students were freed from the constraints of time and place because they could participate in online discussions 24-hours a day. The absence of time and place constraints therefore provided participants with more time to post their contributions. However, students had to be on campus to be able to use the DB because the asynchronous board was connected to the Intranet not the Internet.

Based on the previous findings, it can be concluded that asynchronous e-learning tools have the power to enhance students' interaction with the instructor, peers, and instructional content. But, this interaction can be impacted not only with the type of media used,
but also with surrounding circumstances of the use of these media such as accessibility, availability, ease of use, speed and availability of response, and privacy. Such factors may encourage and inspire students to participate more effectively.

This finding was in agreement with the findings of other studies. For instance, Wijekumar and Spielvogel (2006) concluded that the asynchronous format is a powerful resource that helps learners engage more frequently in discussions with greater confidence and with greater enthusiasm in the interaction process by providing feedback on their paraphrasing and focusing on the relevance of the posting. Similarly, Biesenbach-Lucas (2003) argued that student preferred asynchronous format because it provides them with a realistic audience (their peers) and a real purpose for writing. In other words, they were required to write to their peers, not only the instructor. Therefore, students had to do more than demonstrating knowledge; they also had to agree and disagree in a relatively public forum. Also, Johnson (2007) argued that the wide range of questions and answers posted by students while using asynchronous communications can help them to integrate different learning activities such as analyzing and synthesizing ideas from different recourses like peers' postings, and instructor's feedback.

On the other hand, the use of asynchronous tools has its limitations; including: (i) Lack of immediate responses, (ii) heavy extra workload, (iii) deficiency of students' commitment, and (iv) inadequacy of involvement and guidelines from the instructor. In terms of addressing these limitations, participants offered several suggestions for more effective, thoughtful, and reflective asynchronous discussion. These included the following: (i) providing specific and detailed illustration of e-learning assignments and their length, (ii) concentrating on particular and precise issues, (iii) providing guidelines for postings evaluation, and (iv) deleting irreverent and repeated comments. They concluded that these suggestions will make e-learning activities more powerful and beneficial by assisting them to demonstrate high level of effective learning and critical thinking, post more concrete and valuable responses, in addition to save time and effort.

While it is substantial to give students some space to freely express their views on specific topics, there should be a limitation of the much time they should spend reading and writing messages. Defining the nature, the minimum and maximum length of postings will help students write good and adequate responses, and promote their awareness of the criteria to use in assessing theirs and the peers’ postings. In addition, it is recommended to concentrate on discussing particular and precise issues rather than concentrating on one topic of interest. According to participants, discussing specific issues lead them to demonstrate high level of critical thinking and effective learning. However, this strategy requires students to think and carefully analyze before posting their comments. In this case, posting for the sake of posting will not be acceptable, which in turn will reduce the number or irreverent and repeated comments that waste students’ time and effort.

Another remarkable suggestion for improving the quality of asynchronous tools was providing clear criteria for evaluating postings and rewarding policy. Such criteria increase the quality of postings by showing students how their work will be evaluated, give them the opportunity to judge and revise their own work before posting it, and motivate them to do better. It is also recommended to encourage students to use the board or blog to share knowledge and ask for what they need rather than emailing the instructor or each other. Moreover, it is important to set specific deadlines for postings to keep the discussions on track and motivate students to participate in the right time. These strategies may contribute to enhance the effectiveness of the DB and the blog in generating and facilitating effective online interaction.
CONCLUSION AND IMPLICATIONS

In this paper, we have examined the role of asynchronous e-learning tools in generating and facilitating online interaction between students and content, student and student, and student and instructor. We have also identified the challenges of using these tools, and provided suggestions to address the challenges. Data from participants suggested that they praised the role of asynchronous tools in enhancing their interaction and learning through providing them with different resources and extra time to express their thoughts more freely and descriptively. Such engagements and interactions happen in a “free” social space where students can afford to take risks with lowered real-life consequences as they share, agree or disagree on ideas and perspectives, (Biesenbach-Lucas, 2003).

However, participants identified a range of challenges that might hinder the effective use of asynchronous tools. The most important challenges concerning participants were the lack of immediate responses, heavy extra workload, inadequacy of involvement and guidelines from the instructor, and deficiency of students’ commitment. Similarly, the participants offered several suggestions for improving the effectiveness of asynchronous tools such as providing specific and detailed illustration of e-learning assignments and their length, concentrating on particular and precise issues, providing guidelines for postings evaluation, and deleting irreverent and repeated comments.

Based on the findings of this study, a number of implications were offered in order to achieve a better result in terms of using asynchronous tools to enhance interaction. First of all, AU needs to encourage and motivate its faculty members and students to utilize asynchronous tools as an integral part of their teaching and learning process. Instructors and students should also be encouraged to participate in new technology evaluations that can support their own teaching and learning growth. Building effective online activities demand a strong commitment from both instructors and students.

In addition, AU should provide training programs for faculty members and students that focus on the effective use of asynchronous tools, and provide online activities is a complicated process. These activities should neither be about using modern technology to replace the traditional classroom only, nor about posting content on the web to be downloaded and read. Asynchronous format is a way to provide a new set of tools that add value to the entire traditional learning environment. Training programs could help faculty and students create and implement their online activities as independent and effective as possible.

Finally, this study has made some contribution to the research literature related to asynchronous tools; nonetheless, there is a need for further research to investigate other issues, such as the impact of asynchronous tools on students’ teaching methods, students’ perceptions of their own learning using these tools, the types of online assignments that meet students’ needs, the types of training programs faculty and students need, and the ways of evaluating online responses. Such issues will help educators to see the world from their students’ perspectives and prepare themselves to understand variations in ways students perceive their own learning in the context of asynchronous tools (Johnson, 2007).

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