ICT-Supported Interactive Learning in Engineering Education: Bangladesh Context

Md Kabirul Islam

Abstract— Proliferation of ICT in teaching and learning in higher education is still very slow in Bangladesh, but this modern technology has been an integral part of education in western universities. This study has examined the under-graduate and post-graduate students' responses to a Learning Management System (LMS) Moodle introduced first time ever by a private university in Bangladesh. The students were asked, in face-to-face classes, to participate in online interaction on weekly tasks given by the teacher. Students' learning activities in LMS were monitored and required facilitations were provided. At the end of the course, a questionnaire was administered to understand students' views of the LMS. The result revealed that the level of student participation in LMS was low, but Interaction occurred among a few post-graduate students in the discussion folder. The quality of their messages was appreciable in terms of knowledge acquisition.

Keywords— Collaborative Learning, Learning Management System (LMS), Blended Learning.

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1 INTRODUCTION

Collaborative leaning is an umbrella term for a variety of educational approaches involving joint intellectual effort by students and teachers for a common purpose [13]. In western universities, in face-to-face setup, usually students are working in groups mutually searching for understanding, or solutions. Previous studies have found that this kind of student discourse occurs in an ICT-supported learning environment [4], [3], [21], [19], [11], [15]. As a university teacher this author has perceived that university students in Bangladesh are quite unfamiliar with collaborative learning and its benefits.

In the face-to-face teaching and learning setup in Bangladesh, the lecturing method is considered by the teachers as the main method regardless of the subject and grade level. In this face-to-face situation, the teacher is responsible for delivering the lecture materials according to certain plans. The students are expected to listen to lectures and to remember them when asked to submit an answer to a question to ensure that the students understand the topic. A kind of 'teacher-student' interaction is present although the scope is very limited. In the class normally students are not given any activity or task to discuss among themselves, nor are they getting an opportunity to present their ideas. In fact, the aspect of sharing ideas and acquiring knowledge through interaction among students is almost absent [24]. The educational activities are basically teacher-centred. The concept of 'interaction between students' and its effect on students' understanding have been ignored in the current situation. As a result, listening, reading, and remembering the ideas acquired have become a practice of learning and passing the examination.

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In the recent years, the number of internet users has increased greatly in Bangladesh, and most of the universities have good internet facilities [12]. Nowadays majority of the university students are skilled with the computer and the internet regardless of their course of study. Now the question arises: how the students with no or little familiarity with their discourse do respond in an ICT-supported collaborative learning environment?

This study will examine in what ways the students studying at a university in Bangladesh behave in a technology-supported learning environment. The courses offered were based on a blended approach.

2 LITERATURE REVIEW

The strands of literature in this section are collaborative learning, theoretical basis of online collaborative learning, and blended learning and use of online facilities based on previous research.

2.1 Collaborative Learning

Collaborative learning may be defined as students in the same grade (level) working together on a topic for a common purpose. In face-to-face teaching-learning situation, social interaction among students enrolled in the same course of study is viewed as fundamental to achieving learning [5], [22] which is consistent with Vygotsky [24] who establishes that students construct knowledge through social interaction with their peers. Vygotsky's [24] theory emphasises that the range of potential each learner has for learning when the learning is designed by the social environment in which it accomplishes is greater than the actual ability of the individual learner when the learning is facilitated solely by someone with greater expertise [25]. Furthermore classroom learning is promoted greatly when students are involved in group interaction within members of their communities [13]. Zurita and Nussbaum [28] summarised five factors for effective col-

laborative learning from previous work. These are (i) individual student responsibility to learn with the group and contribute where possible, (ii) helping to teach other members of the group through frequent exercise of social skills during group interactions, (iii) team members should reach their individual goals which is an indication for their success, (iv) decision making must employ members' ability to exchange opinions and build consensus, and (v) Discussion, social interaction, and consensus building can be achieved in small groups.

2.2 Theoretical Basis of Online Collaborative Learning

Different web-based Learning Management System (LMS) may be used for creating online collaborative learning environment. It can be designed on the understanding that web-based computer-supported systems can support and facilitate group processes and group dynamics in ways that are achievable by face-to-face [32], but online interaction differs in quite important ways from face-to-face discourse [31]. Many theories especially Social Constructivist theory supports above understanding of online collaborative learning [30]. From theoretical point of view, online collaborative learning aims at providing both an authentic environment and multi-perspectives that can tie in students' prior knowledge [9]. The web-based systems are cognitive tools that can team individuals of a peer group with the technology to form a joint intelligence which shares the labour during the group interaction in the form of textual message posting [14]. An explicit goal of this environment is to facilitate deep understanding. This kind of computer-mediated communication offers teachers the opportunity to create an environment of learning that enables students to discuss the task and acquire skills through reflection on the task and evaluation of students' messages [9]. It allows teachers help students to construct their knowledge using their experience and provide guidance in their meaning making process. The technology or the teacher can support and stimulate students' activities that engage them in thinking, understanding the instructions and presenting ideas intellectually about the topic or the task [15].

2.3 Blended Learning and Use of Online Facilities in Learning

Across the world there has been an increase in the use of information and communication technology in higher education, especially in western universities, although the technologies themselves may vary, from video-conferencing to LMS, CD ROMs and Smart Phones. For example, in the UK by 2005 over 95% of institutions of higher education supported a Virtual Learning Environment (VLE) and the term 'blended learning' is now commonly used to refer to the mix of face-to-face and e-learning that constitutes the higher education experience of students [4]. Several studies conducted by previous researchers in higher education illustrate the impact of blended learning, learners' perceptions, and teacher's role. Some of the studies are reviewed in this section. The online environment was created with different learning management systems.

Livingstone and Condie [16] investigated the impact of ICT on learning and teaching in a higher education course that integrated traditional classroom teaching with online component for student learning. The results showed that the student used online facilities (resources, interaction facility, assessment task etc.) considerably more than expectations of their teachers, and the students preferred a blend of learning experiences using materials and more conventional printed text-booklets. The use of online facilities improved students' skills in accessing the internet and other computing abilities. A similar study was conducted by Rye [20] where students felt that ICT would be important for their study as they can have ready resources from their teachers and information from their classmates, although only a few of them used the online learning system regularly. Woo, Gosper, McNeill, Greg, Green, and Phillips [26] found WBLT (Web-based Learning Technologies) has positive impact on student learning as they can communicate with each other for sharing experience and views. Students felt the web-based learning activities are new experiences for them, especially in responding to others' messages [19]. However, academic guidance is needed on what and how to use the technology effectively for independent and self-directed learning, even at that institution also where ICT skills level of students are high [4]. Moreover, in order to maintain high quality learning appropriate assessment plans and adequate facilitation must be particularly reinforced [19].

Content analysis of online discussions revealed different patterns of students' interaction for knowledge constructions [10], [27]. The researchers observed that students performed online interactions by posting textual messages that contributed to the knowledge construction at different levels from simply sharing facts, opinions and experiences to elaborating one's own or others' ideas, to applying and transferring knowledge in practices. However teachers in online classes may promote students' motivation by giving relevant and accessible discussion tasks [10].

The students who have poor attendance in face-to-face classes may benefit from engaging in a Virtual Learning Environment for their learning and that may improve their assessment performance [17]. But students' absences from face-to-face class could suffer from a poorer learning experience if they choose not to attend the face-to-face lecturers [26] in a blended learning approach.

Previous researchers suggested that the facilitation tasks include providing feedback to learners, promote interaction and specific comments on the discussed issues with summarization at the end of class discussions [6], [18] and intervening and promoting students' participation in the discussion in various ways when it becomes quiet [1], [18]. Encouraging students to provide timely responses and feedback to class members helps boost the students' sense of participation and learning in online learning communities [7] and to develop a sense of becoming more responsible, self-directed learners, and to learn in a more collaborative, authentic and responsible way [19]. Some online facilitators reinforced students'

interaction and engagement by laying out clear assessment specifications and setting aside a high percentage of the grade to the class-level online discussion activity [18], [23].

The literature review indicates that blending learning approach with an online component provides enormous prospect for student collaboration both on-campus and off-campus and teacher's support to promote learning.

3 THE STUDY

This study was conducted at Daffodil International University (DIU) in Dhaka City in Bangladesh. DIU has created a web-based teaching and learning environment using open source LMS 'Moodle' as part of the university's E-education Programme to provide students with an extra support for communication with their teachers and fellow students in addition to scheduled face-to-face classes.

In spring 2011 (semester) LMS Moodle was used for four under-graduate and one post-graduate groups of students enrolled in different courses. The number of students in each section is presented in Table 1.

Table 1: Number of students enrolled in different courses

Course	Section	Level	Number
Physics II, CSE	A	Under-graduate (semester 2)	31
Physics II, CSE	B	Under-graduate (semester 2)	30
Physics I, TE	A	Under-graduate (semester 1)	40
Physics I, SWE	A	Under-graduate (semester 1)	40
eCommerce, CSE	A	Post-graduate	13

Note: CSE-Compute Science and Engineering, TE-Textile Engineering, SWE-Software Engineering

Most of the under-graduate students had different levels of computer literacy as they used e-mail and facebook. But all post-graduate students of CSE were well conversant with ICT. Majority of the students selected for this study had required information literacy and ability to use a learning management system for their learning. The students comprised both male and female. Out of 13 post-graduate students eleven had a job. The students were given an orientation on different features of Moodle, registration process, and teaching and learning process using Moodle in the face-to-face classes. The above courses (Table 1) were created for each section (group) in the Moodle. Moodle consists of several features such as course information, news, calendar, and Forum for posting lecture materials including the discussion task. During the semester, each group of students was given weekly discussion tasks for several weeks related to their face-to-face lecture topic and asked to response to the tasks individually and then participate in interaction with their fellow students. No students had previous familiarity with learning management system or e-Learning.

The study sought to answer the following research questions:

1. Do students use Moodle to respond to the teacher's task?

2. Do students participate in online interaction on the task set?

Students' participation in weekly discussion folder was ob-served, and the textual messages of each group were count-ed. Students' experiences of using Moodle were collected in several face-to-face meeting throughout the semester. At the end of the course, a questionnaire was administered to collect students' experience of using Moodle for their learning. Both quantitative and qualitative data analysis techniques were utilised..

4 RESULTS

4.1 Frequency of Online Message Posting

Two groups of first semester students (TE and SWE) and two groups of second semester students (CSE- A, and CSE- B) were given discussion tasks for two and three weeks respectively. The number of messages posted by these students in response to the tasks is given in Table 2.

The number of students posted messages in response to the teacher's task varied in different groups. Quantitative analysis of message posting showed that messages posted by individual students varied from one to four. Although the number of messages posted by the student was low, it is satisfactory from teacher's point of view as the system is absolutely new to the students. Some students reported that they could not access to the Moodle or failed to do registration. It was found that some students posted messages using another student's ID. This may indicate that they were motivated to use the system but could not respond to the task in a timely manner. At least 10% of the total under-graduate students participated in this study had lack of sufficient internet or computer literacy which indicates that unskilled position might prevent them for going online. At least 10% students had internet access at home and most of them responded to the task from home.

The course teacher monitored student message posting and made comments on students' ideas. The teacher responded to individual student who posted a message to make their understanding clear about the topic and encourage them for further message posting. The teacher posted a total of 43 messages in different weeks for four groups of under-graduate students. In face-to-face meeting, students reported that they had limited Internet facilities in the department for posting messages in Moodle.

Post-graduate students posted a total of 84 messages in four different weeks in the discussion folder. The average number of messages posted by these students is about 6.4. It was found that each student posted at least one mes-

sage in every week's discussion. The teacher posted 20 messages for facilitating this group.

Table 2: Number of messages posted by students in moodle

Week	Under-grad First semester		Under-grad Second semester		Post-Graduate
	SWE (A) *N= 40	TE (A) *N= 40	CSE (A) *N= 31	CSE (B) *N= 30	CSE *N= 13
Week 1	19	34	20	21	15
Week 2	15	33	17	17	21
Week 3	-	-	20	27	33
Week 4	-	-	-	-	15
Total	34	67	57	65	84
% of students participated	50	72.5	67.7	60	100
Teacher's messages	8	9	11	15	20

N is the number of students enrolled in the section

4.2 Student Online Interaction

In under-graduate courses, very few interactions took place between students and that was not content related. They responded to their fellow students to support one's posting or encourage fellow students by giving thanks. This kind of response is quite good rather than remaining silent. This group of student is termed 'silent students' in this study. The data from questionnaire and face-to-face interaction with students show that the students who responded to the given tasks have acknowledged that the textual messages enhanced their understanding of the topic after reading others' postings and teacher's feedback and comments [10].

In Electronic Commerce class, post-graduate students were involved in asynchronous interaction with their fellow students, but few students participated in different weeks. However message posting on the task set continued for the whole week. It was found that the level of interaction be-tween students and its quality was encouraging. An example of student interaction is given below:

The pattern of student interaction presented in Figure 1 shows that Student 2 made positive comments on a posting of Student 1 who responded to the task and asked for further clarification, which means that Student 2 sought help from Student 1. Student 1 explained the term requested by Student 2 in the next stage. The course teacher encouraged Student 1 and posed questions to him, and consequently Student 1 appeared again to answer teacher's questions confidently.

In the above interaction, asking questions, sharing ideas and helping fellow students occurred during class discussions in Electronic Commerce course. The teacher's facilitation may have promoted their message posting and further under-standing of the topic. It appears that three types of interaction happened in the Forum (weekly

Student 1 (Responded to the weekly task)
………………After that I have compared most of the criteria which are given bellow.
1. Generation of traffic,………………….
Student 2 (Responded to Student 1)
Nice work. I'm not clear about the meaning of "Generation of traffic"
Student 1 (Replied to Student 2)
Thanks for your question and sorry for the late reply. Generation of traffic means getting more visitors to your website or blog. Or it is about getting more subscribers, i.e., Building your list of users or visitors on your website or blog. ……………………Thanks,
Course Teacher to Student 1
Thanks for your answer to (Student 1). I have another question to you. How do you assess 'Generation of Traffic' as an observer or user? Is there any indication to understand this?
Student 1 to Course Teacher
Thanks for your question. Web traffic is the amount of data sent and received by visitors in a website. It is a large portion of Internet traffic. This is determined by the number of visitors and the number of pages they visited. ……………………..........................

Figure 1: Pattern of student interaction in e-Commerce class.

discussion folder) such as student-content, student-student and student- course teacher [2].

5 DISCUSSION

It is mentioned earlier that in the universities of Bangladesh the students are not very much familiar with peer group interaction or collaborative learning. The students have very limited scope for sharing ideas and experiences in the class. The main intention of this study was to examine how the students with little familiarity with interaction behave in an online environment where communication happens only by posting textual messages.

This study sought to answer two research questions. The first research question is: Do students use Moodle to respond to the teacher's task? The results show that the under-graduate students were motivated for using the online sys-tem (Moodle) for their learning where they contributed different levels of messages although the facilities available for posting messages were very limited. The number of messages posted by the students was low [20] and not all students posted messages in a particular week [29]. In Bangladesh context, it is not surprising as the students had limited facilities to access Moodle in the campus, and they had English language barrier as well. The under-graduate group comprised both first and second semester students. Although this group had very little familiarity with the computer and the internet but more than 50% student contributed messages to the weekly discussion folder which indicates that they were motivated for using online facilities [16]. The post-graduate students possessed adequate skills [4] for using

the learning management system and their contribution to the discussion folder was much higher than the undergraduate group. The course teacher had the opportunity to encourage students in both face-to-face and online classes [4]. This is an advantage of this blended approach of the course.

The second research question is: Do students participate in online interaction on the task set? The findings of the study reveal that the interaction between undergraduate students in the weekly discussion folder was sporadic, and there was no content related interaction between students. Presumably the students' had inadequate knowledge of the content of the task, lack of facilities and lack of confidence, and difficulty in understanding English language [8]. Among 13 post-graduate students in Electronic Commerce Course, few took part in interaction for sharing experiences and supporting fellow students [27]. This indicates that students can be directed towards collaborative learning if opportunity is given, and there is a strong possibility that they might be able to take responsibility of their own learning with limited teacher's support [19].

6   A MODEL OF ONLINE MESSAGE POSTING IN MOODLE

The findings suggest that the teachers attempted to promote message posting and interaction through posting discussion tasks in the forum and providing feedback to students in discussion. These strategies appeared to be insufficient and his/her effort had a limited success since the number of messages posted was low and there was 'silent' behavior from some students in responding to the task in each course. Hence three aspects are related to message posting such as the discussion task, teachers' support, and students' participation in discussion [10]. A single factor cannot explain message posting properly. The above three aspects the discussion task, teachers'
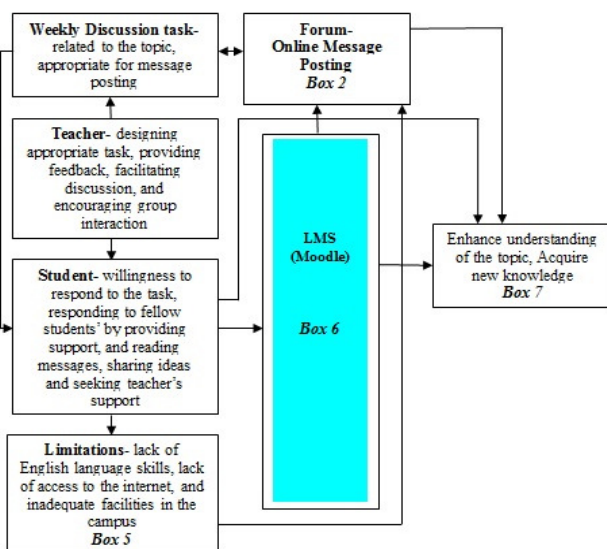

Figure 2: A model of online message posting in Moodle.

support, and students' online interaction are interrelated

which is illustrated in Figure 2.

7   CONCLUSION

The participants in this study had a range of experience of using the internet. On the basis of the findings, it may be assumed that the students do not have any technology phobia, and adaptation of a new teaching and learning environment would be possible for them if adequate support [19] is provided. This might have a positive impact on their learning [26].

In essence, transition from traditional method of delivering lectures to student-centred participatory method may be difficult for the university faculties in Bangladesh, but it is not entirely impossible. The findings of the study suggest that students may gain collaborative learning experience by using web-based learning environment and acquire skills in responding to fellow students if proper facilitation and guidance are available.

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