

Analysis of Synchronous and Asynchronous E-Learning Environments

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Abstract— Global interest in e-learning is growing rapidly. This paper analyzes the distinctive synchronous and asynchronous e-learning environments and modes and their communication tools. The research question is whether an asynchronous model could be totally replaced by a synchronous model or a blend of the two better facilitates learning? The study examined distinctive communication tools alongside their uses and shortcomings. In addition, it used survey research to collect the perceptions of students on their experiences on online courses at Illinois State University, USA. The population of the study comprises of 38 students, who have prior experiences with synchronous and asynchronous e-learning courses and computer-mediated discussions. Based on the findings, the researcher proposes a blend of synchronous and asynchronous e-learning patterns and their communication tools to devise a supreme environment for e-learning.

Keywords— E-Learning, Massive Open Online Courses (MOOCs), Synchronous e-learning, Asynchronous e-learning, Communication tools

I. INTRODUCTION

The workforce today is expected to be highly educated. They need to continually improve skills and acquire new knowledge by engaging in lifelong learning. E-Learning is defined as teaching and learning online through network technologies and arguably one of the most powerful responses to the growing need for education (Clark, 2007). The concepts of e-learning have been around for decades in the education practice. However, with the development of technology and tools for Massive Open Online Courses (MOOCs), understanding the distinctions of the tools can help managers and business owners to tackle their real-world training challenges. It is the convergence of the technological and pedagogical developments that is driving e-learning innovation in higher education (Murphy, 2011). E-Learning is formally defined as electronically mediated asynchronous and synchronous communication for confirming and constructing knowledge (Hrastinski, 2008).

Online learning includes synchronous, asynchronous and hybrid learning environments. Synchronous learning environments give real-time communication, which can be cooperative in nature when incorporating exercises (Salmon, 2013). For example, an instructor's lecture with the facility of

questions-answer sessions. But a synchronous session requires simultaneous or concurrent student-teacher presence. On the other hand, asynchronous environments are not time bound. Students can work on activities on their own paces. A hybrid online environment blends synchronous with asynchronous sets of activities and combines the instructional designs of both to create different patterns. It is important to understand how students perceive learning in the different environments in view of students' observations and learning examinations (Greller & Drachslar, 2012). This paper discusses the favorable circumstances and drawbacks of the two methods in regarding to student learning. Particularly, this study examines the problems in synchronous and asynchronous learning environments using the data from student learning in the Illinois State University (ISU), USA.

When considering the utilization of synchronous and asynchronous methods to encourage online learning, little is thought about on how individuals utilize synchronous and asynchronous innovation and technology (Driscoll, 2002). Students are still facing problems due to the limitations and incorrect choices of communication tools in e-learning courses. The role of interactivity in e-learning is essential because it impacts on student learning outcomes, engagement and satisfaction (Liu, 2017). This research scrutinizes asynchronous and synchronous e-learning environments, the related communication processes, and their effects on student satisfaction based on student perceptions. The purpose of this study is to identify which mode of e-learning environments and communication tools can better support and enhance learning and provide satisfaction in online courses. The results of this study could provide academic institutions and workforce development/training managers with the means to design e-learning more meaningfully and effectively.

The objective of this study is to understand the overall perception of students regarding asynchronous and synchronous modes of e-learning and the communication tools utilized respectively. Thereby, the authors collected students' responses using survey tools. After the collection of the survey data, the authors focused on the following research questions: Question 1: What is the student perception of different asynchronous and synchronous communication processes used in e-learning environments? Question 2: Does asynchronous communication process facilitate learning or hinder the process? Question 3: Can an asynchronous model be totally replaced by a synchronous model or a blend of the two better

facilitates learning? The perception of students in regarding to e-learning environments and communication processes was the response variable. The asynchronous communication tools, synchronous communication tools, asynchronous e-learning mode, and synchronous e-learning mode were independent variables. These independent variables were the foundation of the survey questionnaire to determine the response variable. The analysis of this research study was based on the self-reported perception of students. There was no direct observation of the conducts and behaviors of students in synchronous and asynchronous e-learning courses or computer-mediated discussions. The student tendencies in the survey didn't infer the learning viability or effectiveness of any selected tools. The assumption was that the respondents had enough computer literacy and attempted the survey questionnaire on their own without any bias.

II. LITERATURE REVIEW

The literature review discusses the types of interactions that occur in learning environments the learning characteristics and preferences of students. Figure 1 explains the basic hierarchical structure of e-learning with different environments and communication types.

Asynchronous E-Learning

Asynchronous e-learning is a standalone approach, planned particularly for self-study, with which the learner and instructor work separately (Doo,2009). Asynchronous environments furnish learners with promptly accessible materials in the form of articles, audio/video lectures, presentations and handouts. Regarding invigorating student's interest, asynchronous environments grant students with the freedom to spare and download lecture materials and to watch and audit the contents at their own paces either online or offline. (Raymond, Atsumbe, Okwori, Jebba, 2016). All these materials are available at anytime and anywhere through Learning Management Systems (LMSs) and other various channels. LMSs enable the storage and conveyance of learning contents for the purpose of training and learning. Some institutions develop and manage their own LMSs whereas others either purchase or use open sources. For example, ISU has developed their own LMS to provide online learning environment to learners.

Asynchronous e-learning is the most received strategy for online training on the grounds that students are not time bound and can react at their relaxation (Parsad and Lewis, 2008). Delay in response enables them to higher learning abilities so that over a period of time it might result in *divergent and critical thinking*. Therefore, "asynchronous space leads to a self-paced, independent, student-centered learning" (Murphy, Rodriguez-Manzanares & Barbour, 2011). Since there is less pressure as compared to what the real-time experience has, learners can respond in a more creative and ingenious manner. Plentiful of time is available to complete learning activities. Therefore the chances of getting aggravated by technological

issues, such as loss of connectivity and low internet speed, are very little. It allows students to consider complex data previously found, engage with and react in following discussions, contrary to the situation when students have time limitations disabling them to be involved in deliberations. Asynchronous e-learning can be done even when a student is offline.

Synchronous E-Learning

Synchronous cooperation gives inspiration to react and takes group work into consideration, including arranging and trading of thoughts (Hrastinski, 2008). This model of e-learning has a structure that has both instructors and learners working together. Synchronous e-learning involves instructor-learner interaction and learner-learner interaction. Moore (1993) defined interaction in a learning environment as an incorporation of communication among students/learners and instructors, students and contents, and students with other different students. A synchronous virtual classroom is a setting for teachers and students to associate and work together in real-time. The fundamental advantage of synchronous learning is that it empowers students to keep away from feeling of isolation or separation since they are in communication with others all through the learning procedure. However, synchronous learning is not adaptable regarding time because students would need to set aside a particular time slot with a specific end goal to go to a live teaching session or online course progressively. So, it may not be perfect for the individuals who have time conflicts in fixed timetables. Synchronous e-learning is live, ongoing and regularly planned, with encouraged direction and learning-focused cooperation (Shahabadi and Uplane, 2015). There are three primary impacts for synchronous e-learning: classroom, media and meeting (Clark et al., 2007). Utilizing webcams and in-class discussion features makes it very similar to traditional classroom teaching except that learners can access it remotely on Internet (Khan, 2006). Learners can access pre-recorded lessons, replay instructor's lectures many times, and provide feedback which is an effective instructional practice for improving achievement (Denton, 2014). Synchronous sessions can bring elevated inspiration to students and remain them occupied with exercises (Yamagata-Lynch, 2014). Some challenges of the synchronous e-learning include accessibility at a given time and bandwidth of internet. In addition, its pedagogy requires a precisely formulated design of instructions.

Following are the advantages and disadvantages of synchronous e-learning and asynchronous e-learning:

Table 1 The comparison between synchronous e-learning and asynchronous e-learning

	Advantages	Disadvantages
Synchronous e-learning	<ol style="list-style-type: none"> 1. Communicate in real-time 2. Clarify certain ideas promptly 3. Instant feedback and answers 	<ol style="list-style-type: none"> 1. The same learning pace 2. Less attention 3. Depending on the quality of instructor
Asynchronous e-learning	<ol style="list-style-type: none"> 1. Continue as your own pace 2. The same Content 3. Flexible learning time 	<ol style="list-style-type: none"> 1. No promptly accessible answer 2. Less motivation 3. Lack of other participants

Asynchronous and Synchronous Modes of Communication

An important element for knowledge transfer between instructors and learners is communication. The usage of communication technology in the field of e-learning is influencing how teaching and learning are communicated, helped and fortified through utilization of computerized or propelled specialized devices. **Table 2 shows the different types of synchronous communication tools used in e-learning with their usability and shortcomings (Lim, 2017). Table 3 shows the different asynchronous communication tools along with its usability and limitations (Lim, 2017).**

To gain success in e-learning, instructive establishments and professional associations must understand the preferences and functions of different e-learning communication tools. The preferred learning style is one of the most important criteria for recognizing any individual difference in learning process when considering adaptability (Shahabadi and Uplane, 2015). Synchronous and Asynchronous learning tools (i.e. discussions, texting and websites) assume a vital part in refining web courses by reproducing classroom experiences, not simply amongst educators, but rather among the students also (Shahabadi and Uplane, 2015). The two configurations have an impact in keeping students associated, learning the content, and giving fulfillment in online classrooms (Watts, 2016).

To overcome the constraints of the two e-learning environments, a system can mix instructional conveyance strategies comprising of web/computer-based training, web/electronic performance support system, web/virtual asynchronous classrooms, and web/virtual synchronous classrooms (Driscoll, 2002). Figure 1 shows a blend of synchronous and asynchronous e-learning. Blended or hybrid learning has become a regular practice in higher education. For example, the utilization of asynchronous media such as discussion or online response sheets subsequently supplement synchronous learning in face-to-face phases. (Haselberger & Motschnig, 2016). Studies highlight the significance of student's self-control, application of self-regulatory strategies,

and course participation in a blended learning condition (Zhu, Au, & Yates, 2016).

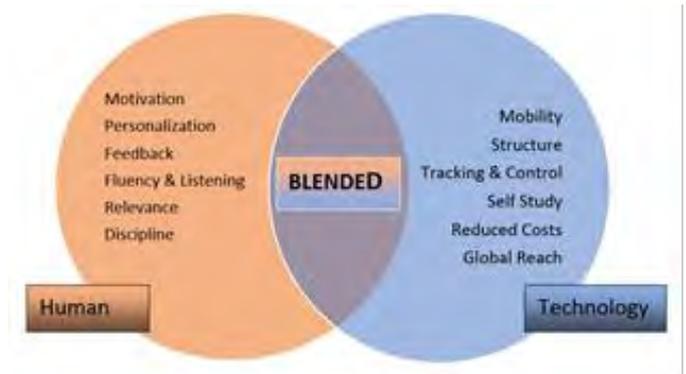


Figure 1

Figure 2 is a representation of the theoretical frame of this research. Synchronous e-learning & communication and asynchronous e-learning & communication are the high level independent variable of this research. They are divided into the detailed independent variables, including different communication tools, skills improved, feedback types, lecture input, direct or indirect collaboration with instructors etc. The dependent variables include factors responsible for the improvement of e-learning.

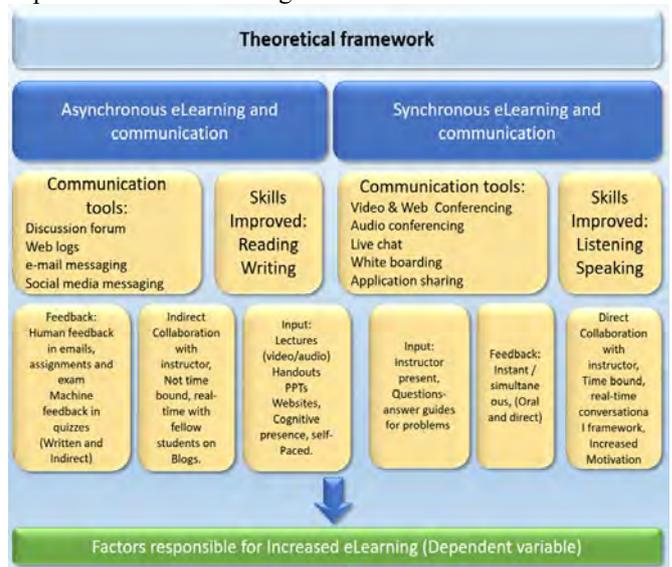


Figure 2 factors responsible for the improvement of e-learning

III. RESEARCH METHODOLOGY

The authors conducted a descriptive research study to evaluate the perception of students engaging in online courses in ISU. The authors selected opinion survey as the research design strategy and used electronically structured questionnaire to collect the responses of students. The questionnaire consisted of 19 questions in total. It included two demographic questions based on genders and majors of the students. The question formats included in the survey are multiple choice and true-false questions. The question design

considered Nominal, Dichotomous and Likert scaling. The test of the reliability and validity of the research instrument was to calculate the mean and standard deviation of each question (dimension) collected from the survey questionnaire. The survey included a pre-test of questionnaire to verify the appropriateness of the questions. The pre-test helped to rectify inadequacies before conducting the survey.

A. Data Collection and Analysis

Out of total 50 participants, only 38 participated responded to the survey questionnaire. The sample size was 38 participants, who had prior experience with synchronous and asynchronous e-learning courses and computer-mediated discussion. The students participated voluntarily. Data collection was for students' preferences and perceptions about synchronous and asynchronous e-learning environments and communication tools in e-learning courses and computer-mediated discussions. The received responses from the participants were measured by plotting pie-chart and bar-charts for every question presented in the questionnaire to determine the percentages.

B. Result Discussion

The demographic details of the students were collected in the first two questions of the questionnaire. The first question was to identify gender. The total number of participants in the questionnaire was 38, out of which 53% were male and 47% were female. Question 2 collected the data about their academic majors. The academic majors included technology, business, mathematics, information, law, psychology, economics and computer science. Questions 10 and 11 referred to students' awareness about synchronous/asynchronous e-learning environment. Figure 4 shows that out of 38 participants, 30 students were aware of synchronous e-learning and 32 students were aware of asynchronous e-learning. A total of 79% and 84% of participants were aware of synchronous and asynchronous modes of e-learning respectively. Following is the description of their responses. Figure 5 shows that 40% participants (n=15) preferred self-directed and self-paced whereas 26% participants (n=10) neither agreed nor disagreed. The mean value and standard deviation of response are 7.6 and 5.5 respectively.

Figure 6 shows the opinion on instructor feedback. There were 58% participants (n=22) agreed that computer-mediated discussion was more effective when instructors provided feedbacks on the discussion; whereas 13% participants (n=5) neither agreed nor disagreed; 13% strongly agreed on feedback. The mean value and standard deviation are 7.6 and 8.1 respectively. Question 13 explored the greatest weakness of asynchronous communication tools. Figure 7 shows the results. There were 53% participants who chose "All of the above"; whereas 18% and 16% chose "No, face to face interaction with teachers" and "No, simultaneous answer" respectively. Question 14 asked about the greatest strength of synchronous e-learning communication tool (as shown in Figure 8). There were 63% participants who answered "All of the above" as the strength of synchronous e-learning communication tool;

whereas 18% found face to face interaction with teacher as the greatest strength. Figure 9 shows the results of the question about the greatest weakness of synchronous e-learning communication tool (in question 16). There were 45% (n=17) students who considered "being time bound" as the greatest weaknesses of synchronous e-learning communication tools; and 24% (n=9) considered "High bandwidth" as weaknesses of synchronous e-learning communication tools.

Question 17 asked about the greatest strength of asynchronous e-learning communication tool (shown in Figure 10). There were 71% participants (n=27) who answered "All of the above" as the strength of asynchronous e-learning communication tool; whereas 11% found "Not place bound" as the greatest strength. Questions 18 and 19 sought students' preferences for synchronous and asynchronous modes. There were 61% students who were in favor of blend of synchronous and asynchronous e-learning. Moreover, most students recommended both types of e-learning environments for online courses based on their perceptions. Responses received by students for questions 4, 5, 6, 7 and 9 show mixed reactions between synchronous and asynchronous environments. According to the responses for questions 12 and 13, the majority of students were aware of different communication tools utilized in synchronous and asynchronous e-learning.

The following items are a summary of the responses:

1. Students felt more comfortable using asynchronous communicational tools in comparison to synchronous communication tools as they could easily access those offline. Furthermore, students strongly agreed that the presence of instructor and prompt feedback during a class makes them learn better.
2. Asynchronous mode is beneficial for doubtful and shy students. It might be uncomfortable with computer mediated discussions.
3. Since synchronous and asynchronous e-learning environments and communication tools have their advantages and disadvantages, a blend of synchronous and asynchronous models should be suitable to MOOC.

IV. CONCLUSION

The purpose of this study is to determine the perception of students in online courses and to identify which mode of e-learning environments and communication tools are most suitable to support and enhance student learning. This descriptive research used survey as the methodology with a structured questionnaire as the instrument to gather data. The results of this research are based on a sample of 38 students (out of 50 students).

The findings of the study indicate that a blend of synchronous and asynchronous modes is more desirable for students enrolled in online courses than either one used solely. The assessment of student perceptions about asynchronous and synchronous learning environments helps researchers to develop a deeper understanding of the relationship between contents, pedagogies, technology and context of the existing instructional design (Koehler & Mishra, 2005). Asynchronous mode can be advantageous as students can build their reactions

by thinking, considering and analyzing. Whereas Synchronous sessions can add strain to react quickly. They can distinguish the levels of preparation. Therefore, for profound e-learning, synchronous e-learning should have scaffold over asynchronous e-learning for deep learning among students. A blend of both learning environments would be ideal. This research study examines numerous zones for future research including the blend of synchronous and asynchronous e-learning environments and communication tools.

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