Students' Interaction and Perceptions in a Large-Enrolled Blended Seminar Series Course

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ABSTRACT
Seminar series can address cutting-edge topics not covered in existing courses, but it is time-consuming for interaction between students in large-enrolled seminars. To promote student interaction without compromising course goals, a large blended seminar series course was designed by combining traditional offline lectures and online discussions for Educational Technology Frontiers course. The study collected posts from online discussion forums. Social network analysis and descriptive statistics were used to analyze students' interaction. The study also conducted three surveys to investigate students' perceptions of course success on the aspects of subject understanding and active learning. Wilcoxon signed rank test was used to determine significant differences of students' subject understanding before and after class. Descriptive statistics were used to explore students' active learning. The results showed that the course promotes students to participate in interaction and students show a high level of enthusiam in interaction. The study also documented a strong and positive influence on students' perceptions of their subject understanding and active learning.

INTRODUCTION
A seminar course can address topical areas considered essential elements of the curricula that do not easily fit with any existing courses (Romanelli, 2008). Further, research shows that seminars encourage students' development of interpersonal communication skills (Popovich, & Jackson, 2004), improve student satisfaction (Porter & Swing, 2006), and enhance students' development of self-efficacy (Popovich, Katz, Iramaneerat, & Smith, 2007). However, the classroom discussion and interpersonal interactions are a practical challenge for course design. Students' interaction in seminars is a time-consuming task, and it is greatly influenced by the amount of quality time (Popovich, & Jackson, 2004).

Recently, professors have used online discussion forums (ODFs) to supplement classes (Alzahrani, 2017) and to facilitate social interaction among students (Cho, & Tobias, 2016). Online discussion allows time for learners to reflect and respond to issues being discussed (Havard, Du, & Olinzock, 2005), which promotes student understanding of a topic (Cho, & Tobias, 2016). Further supporting the value of ODFs, research shows that most students like the atmosphere of peer discussion outside of class (Dao, & Zhu, 2014) .

Students' interaction in large-enrolled seminar course is limited. BL in seminar course is highly effective (Extavour & Allison, 2018). Combining the advantages of seminars and online discussions, we designed a blended-learning seminar series course (BSSC) to promote interaction among students, which combined large-enrolled offline lectures and online discussions in a seminar series on the course of Educational Technology Frontiers. The stdudy is to explore the interaction among students and the overall perceptions of course success of the students who participated in the BSSC. Three research questions of the study are specified as follows:

- How do students interact in a BSSC?

- What level of enthusiam for participation in interaction do students show in a BSSC?
- Is there a change and if so how do students perceive the BSSC success on the aspects of subject understanding and active learning?

LITERATURE REVIEW

BLENDED LEARNING (BL)

Learning is developed through interactions (Vygotsky, 1978). Online discussion promotes the communication and collaboration among students (Al-Ibrahim & Al-Khalifa, 2015). It provides authentic learning opportunities that are not readily available in a classroom setting. BL refers to the integration of such online communication into courses (Alzahrani, 2017; Extavour & Allison, 2018). BL can improve students' flexibility in learning and encourages interaction among students (Ellaway & Masters, 2008).

Research on BL shows that it promotes student learning, especially facilitating students' interaction with peers (Extavour & Allison, 2018). Course designers have taken several approaches to designing seminars that use BL. Roseth et al. (2013) blended synchronous face-to-face and computer-supported cooperative learning in a doctoral seminar. Meretsky and Woods (2013) designed a seminar combining students, remote experts, and practitioners together via a virtual space, which helped students gain additional insight into their field of practice.

STUDENT- STUDENT INTERACTION

Student-student interaction plays a vital role in learning (Jacobs & Ward, 2000; Sher, 2009), supporting maximal achievement, socialization, and healthy development (Johnson, 1981). They are also significant contributors to student satisfaction (Sher, 2009) and perceptions of course effectiveness (Flottemesch, 2000). Many researchers have found that online discussion enhanced students' learning and facilitated their interaction (An, Shin, & Lim, 2009; Hew & Cheung, 2013; Hrastinski, 2008). Social network analysis (SNA) is often used to analyze the networks of student interaction. It's an effective method to analyze interaction among students in ODFs (eg. Zheng & Warschauer, 2015; Suraj & Roshni, 2016).

STUDENT PERCEPTIONS

Prior research has demonstrated that student perceptions can be both reliable and predictive of learning (Wallace, Kelcey, & Ruzek, 2016). Further, students' perceptions shape their learning motivations (Spearman & Watt, 2013). Research on students' perceptions of different course designs has generally been conducted through surveys.

Brunton et al. (2015), for example, evaluated students' perceptions of seminar and lecture-based teaching in restorative dentistry. Their survey on effectiveness, self-development, and interaction showed that students preferred the seminar format to the lecture format. Gajbhiye et al. (2014) evaluated the perceptions and attitudes of graduate students towards seminars from the aspects of satisfaction, collaboration, and understanding. They concluded that the postgraduate seminar method is effective and well-accepted among postgraduate students. Ruchi et al. (2012) investigated students' perception of seminars of first year medical subjects, and the majority of students felt that their school should continue to offer seminars in the future. Extavour and Allison (2018) assessed students' perceptions of BL in a pharmacy seminar course. Questions addressed the effectiveness of learning resources, course activities, the instructor, and the blended delivery, as well as perceptions of the development of critical-thinking.

COURSE CONTEXT

This study was based on the BSS course, Educational Technology Frontiers, which was offered in the Fall semester in 2017. The purpose of the course was to share cutting-edge research areas in the field of educational technology. The instructors consisted of a professor and an assistant whose responsibility was to contact with guest speakers, record offline attendance, and organize online discussions.

LARGE-ENROLLED OFFLINE LECTURES

In light of research showing that guest speakers bring value to courses (Popovich & Jackson, 2004) in particular in seminar series (Zorek et al., 2011), we invited nine famous guest speakers at home and abroad in the field of educational technology to carry out 14 offline lectures. One lecture shares one subject, so there are 14 subjects included in the course. The course was open to all graduate students in a university in China. There were 106 students enrolled in the course. Course meetings took place once a week with a duration of 90 minutes.

ONLINE DISCUUSION

The online discussion for the course was carried out on Daxia, an online learning platform based on Blackboard. After each offline lecture, the teaching assistant uploaded the lecture slides to Daxia and created an ODF

corresponding to the subject of the lecture. According to Dao and Zhu (2014), imposing a deadline for students to contribute is crucial to maintaining student participation to create an active discussion. Therefore, each ODF was open for a week. A WeChat group was also created by the assistant to release learning materials and course notices to all students.

METHOD

ACTION RESEARCH

According to Butz and Stupnisky (2017), an online discussion intervention in hybrid course can improve students' feelings of relatedness with others, which contributes to increasing interactions among students. To design the intervention, a sequence of events that take place at various time points over the course should be incorporated (Butz & Stupnisky, 2017). Action research emphasizes on intervention (Warden, Stanworth, Ren, & Warden, 2013), and involves important issues over long periods of time (Eden & Huxham, 1996) to improve the cycles of action. Therefore,we conducted an action rearch based on students' performances and feedbacks to promote students' interaction, which included three stages of teaching interventions throughout the course, as follows:

Stage 1 (weeks 1-4):

- In each offline lecture, students are required to fill out the attendance form.
- In each ODF, each student must post at least three times.
- ODF discussion topics are freely created by students, but they should be related to the subjects of that week's lecture.

Problems arising in stage 1 :

- Although almost all students took part in the discussion, most students posted less than three times.
- There was minimal student interaction because students were more inclined to create their own topics than to reply to others' posts.
- Many topics were duplicated.

Stage 2 (weeks 5-8):

- Each student must reply at least twice in each week's ODF.
- Students should contribute comments to existing posts instead of creating new topics that duplicate existing ones.

Students' feedbacks after stage 2:

- There was too little interaction with the guest speakers in offline lectures. Students recommended a question and answer session within the offline lectures to interact with speakers in greater depth.
- There was a lack of guidance from the instructors on how they should engage in the ODFs. They requested that guest speakers participate in the ODFs.

Stage 3 (weeks 9-14):

- The addition of question and answer sessions in offline lectures that would take up the final 20 minutes of the the 90-minute course meeting.
- Before the offline lectures, the assistant uploaded learning materials from the guest speakers to the Daxia and the WeChat group so that the students could study them in advance.

PARTICIPANTS

Participants consisted of the 106 students who participated in the Educational Technology Frontiers course. Of these, 15 were PhD students and 91 were master's students. Educational technology students dominated the course, comprising 85 students in the sample, but nine students were majoring in vocational and technical education, two were majoring in curriculum theory, seven were majoring in pedagogy principle, two were students majoring in optics, and one student was majoring in software engineering.

DATA COLLECTION

To explore student interactions, we collected the posts from the ODFs. When each forum closed, we completed two spreadsheets. The first recorded the topic, title, author, date of release, and full text of each post. The second recorded interactions among students. This consisted of an adjacency matrix, where we assigned each student both a column and a row in the matrix. A row represents a repling student, and a column represents a replied student. If two students interacted, then we entered the positive number representing the total number of comments in the matrix cell representing the intersection of these two students. For example, if student S1 replied to comments by student S9 5 times, we entered a 5 in the cell at the intersection of row S1 and column S9.

Three surveys mainly address two aspects of course success: subject understanding and active learning. Subject understanding was assessed through a 5-point likert scale ranging from 1 (understanding not at all) to 5

(understanding very well). Active learning, was assessed using three items. One asked about respondents' reading of existing learning materials using a 5-point likert scale ranging from 1 (not read at all) to 5 (read all). The other asked about respondent's access of extracurricular learning materials using a 5-point likert scale ranging from 1 (never) to 5 (always). The third one used a 5-point likert scale ranging from 1 (not at all dedicated) to 5 (very dedicated) to assess students' dedication to the course. Open-ended questions were used to allow students to provide recommendations for course improvement. The first author created them and the second author reviewed them. The Cronbach's Alpha of the three questionnaires is 0.857, 0.886, and 0.840 respectively. And prior to activation, the surveys was piloted among eight students who reviewed it for face and content validity (Extavour, & Allison, 2018). Response data was collected with Wenjuanxing, a web-based survey service.

The first questionnaire was conducted at the beginning of the course. All 106 students participated. The second questionnaire was conducted after the second stage of teaching intervention (week 9). 101 students participated. The third questionnaire was conducted at the end of the course. At that time 98 students participated. In order to compare the changes before and after the class, we finally analyzed the data of these 98 students in three surveys. Of the 98 students, 29 were male and 69 were female.

DATA ANALYSIS

Descriptive statistics including the frequency and percentage were used to count the posts, topics and replies in the ODFs. For the topics in each forum, we divided the total number of replies in each topic into five segments: 0-5 (low interaction), 6-10, 11-15, 16-20, >20 (high interaction). We divided the total number of replies by each student in each forum into four segments in two categories: passive interaction (segments 0-1 and 2) and active interaction (segments 3-5 and >5). The line charts below show the changes in student interactions across the 14 forums. SNA software Ucinet 6 were used to reveal the networks of student interaction. First, the spreadsheet including interactions among students was imported into Ucinet 6 to generate the interaction network — two data files which name formats are ".##h" and ".##d," respectively. Then, the density, centralization (Outdegree & Indegree) and isolates of each network were analyzed through Ucinet 6.

For the data collected from questionnaires, Wilcoxon signed rank test was used to determine significant differences of students' perceptions of subject understanding before and after class. Descriptive statistics were used to explore active learing of students. A stacked bar chart was used to show students' access to the existing learning materials. And pie charts show the access to the extracurricular learning materials and course dedication of students. SPSS 20 was used for all statistical analyses.

RESULTS

DESCRIPTIVE STATISTICS OF POSTS AND TOPICS IN ODF

POSTS IN ODF

The total number of posts in each forum is around 350 during the 14 ODFs. The number was highest in the first week, at 380; the 5th and 9th week were also high points, at 370 and 372, respectively. The total number of topics in each forum decreased over time, which was from 165 to 30. This included a dramatic drop off in week 5, to 62 from 127 in week 4. However, the total number of replies showed an upward trend over the semester, increasing from around 200 to around 300. The number of replies peaked in the 5th and 9th week, at 308 and 330, respectively (see Figure 1).

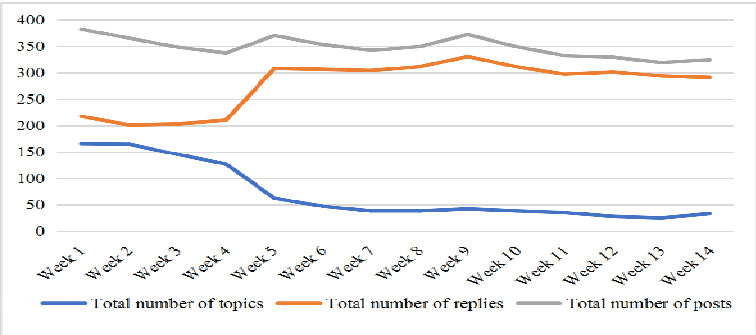

Figure 1. Posts in the forum (14 weeks)

TOPICS IN ODF

Across the 14 ODFs, the proportion of the topics with 0-5 replies remained above 80% in the first 4 weeks. However, this ratio was extremely reduced from ODF 5 to ODF 8. It was only about 30% in ODF 7, then

increased slightly, only to decline slowly but steadily from ODF 9 to ODF 13, when it was about 20%, and only recovered slightly in ODF 14. The number of topics with more than 5 replies was very small in ODFs 2-4, accounting for only about 5% of topics. However, the proportion increased significantly from ODF 5, especially for the topics with 6-10 replies and 11-15 replies, which rose to about 30% and 20% respectively. What's more, the proportion of topics with 15-20 or even more than 20 replies rose from almost 0% to around 15% from ODF 5 (see Figure 2).

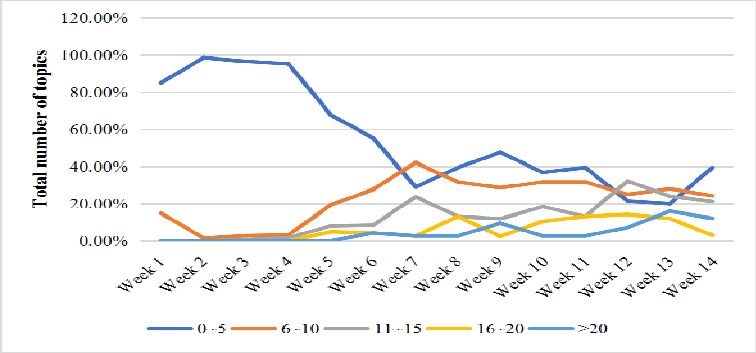

Figure 2. Topics in the forum (14 weeks)

NETWORK OF STUDENT INTERACTION

During the 14 ODFs, the density of the student interaction network was below 0.02 from ODF 1 to ODF 4. Hoever, it increased to more than 0.02 from ODF 5, peaking at 0.0377 in ODF 5. The second highest density was in ODF 9, at 0.0302. The density of ODF 14 suddenly dropped below 0.02. The isolates were no less than 5 from ODF 1 to ODF 4, after which the isolates were never above 3 until ODF 13. At ODF 14, however, the network isolates increased to 10. The outdegree centralization did not change much during the 14 ODFs, and it remained at around 1%. The indegree centralization was below 2% during ODFs 2-5. However, it increased to more than 5% in the ODF 6 and remained that high (see Table 1).

Table 1. The density, centralization (outdegree & indegree) and isolates of 14 ODFs

	Density	Centralization (Outdegree)	Centralization (Indegree)	Isolates
ODF 1	0.0191	1.316%	5.891%	6
ODF 2	0.0173	1.397%	1.397%	5
ODF 3	0.0184	1.672%	1.692%	8
ODF 4	0.0188	1.020%	1.419%	6
ODF 5	0.0377	0.952%	1.019%	0
ODF 6	0.0273	1.994%	5.230%	0
ODF 7	0.0282	1.338%	6.894%	1
ODF 8	0.0300	1.985%	14.484%	1
ODF 9	0.0302	1.599%	8.135%	1
ODF 10	0.0301	1.320%	7.320%	0
ODF 11	0.0263	1.358%	7.447%	3
ODF 12	0.0268	1.039%	8.481%	0
ODF 13	0.0285	0.623%	8.023%	0
ODF 14	0.0176	1.153%	13.907%	10

ENTHUSIAM FOR PARTICIPATION IN INTERACTION

During the 14 ODFs, the number of students with 0 to 1 replies remained at around 40 in ODFs 1-4. However, it reduced dramatically to 1 in ODF 5 and remained below 5 thereafter. The number of students with 3 to 5 replies remained at around 35 in the first 4 weeks. However, it significantly increased to above 65 in ODF 5 and remained high, peaking at 80 in ODF 14. The number of students with 2 replies decreased sightly from 30 to 20 in ODF 5. The number of students with more than 5 replies remained basically unchanged during the 14 ODFs, and remained at around 3 (see Figure 3).

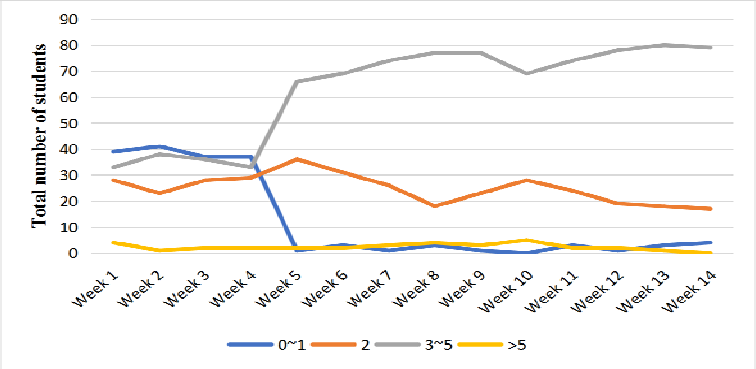

Figure 3. Replies of students (14 weeks)

PERCEPTIONS OF COURSE SUCCESS

For subject understanding, because the lecturers replaced 3 of the 14 subjects after the first survey, we analyzed the remaining 11 subjects. Table 2 shows the results obtained from the test statistics of the 11 subjects understanding before and after class. For the 11 subjects, the Z values are all negative. And the Asymp. Sig. (2-tailed) values are all less than 0.05, espcially less than 0.01 for the subject 1, subject 3, subject 4, subject 6, subject 7, subject 9, subject 12, subject 13, subject 14.

Table 2. Test Statistics[a] of Subject Understanding (after_class - before_class)

	Z	Asymp. Sig. (2-tailed)		Z	Asymp. Sig. (2-tailed)
Subject 1	-6.893[b]	.000	Subject 9	-7.016[b]	.000
Subject 3	-6.224[b]	.000	Subject 10	-3.422[b]	.001
Subject 4	-6.596[b]	.000	Subject 12	-6.927[b]	.000
Subject 6	-5.949[b]	.000	Subject 13	-5.166[b]	.000
Subject 7	-5.365[b]	.000	Subject 14	-4.399[b]	.000
Subject 8	-2.704[b]	.007			

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Accessing learning materials is the most frequently performed online learning activity (Li, & Tsai, 2017). The instructors shared learning materials through Daxia platform and the WeChat group, including lecture slides and relevant references provided by guest lecturers. The posts in the ODF (Daxia platform) and the notices in the WeChat group are also useful learning materials for students. As shown in Figure 4, for the materials on Daxia, 35.24% of students read all; 37.14% of students read most; and less than 1% of students read few or did not read at all. For the posts on Daxia, 12.38% of students read all; 40.00% of students read most; 3.81% of students read few; and less than 1% of students did not read at all. For the materials on WeChat, 19.05% of students read all; 52.38% of students read most; 4.76% of students read few; and none of students did not read at all. For the notices on WeChat, 50.48% of students read all; 35.24% of students read most; 1.90% of students read few; and none of students did not read at all. For the extracurricular learning materials, 50.47% of students always accessed; 39.25% of students sometimes accessed; and less than 2% of students seldom or never accessed (see Figure 5). For course dedication, 80.95% of the students were dedicated or very dedicated to the course; only 1.90% of the students were less dedicated to the course, and no students were not at all dedicated to the course (see Figure 6).

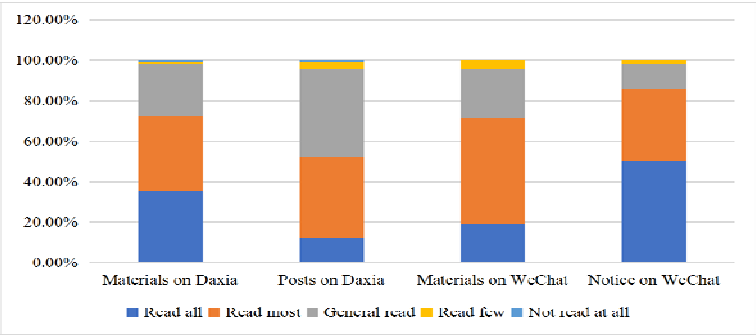

Figure 4. Access to existing learning materials

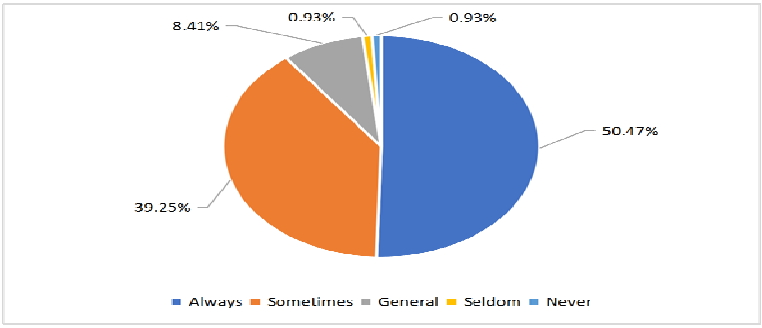

Figure 5. Access to extracurricular learning materials

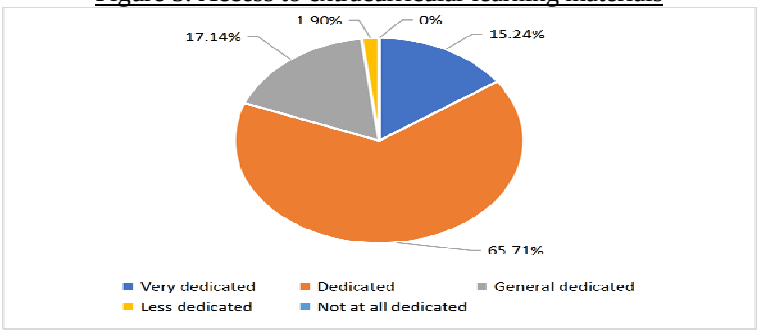

Figure 6. Course dedication

DISCUSSION

Results showed that students interacted through the ODFs. For the descriptive statistics of posts and topics in ODFs, the total number of topics in each forum decreased significantly, and the total account of replies increased greatly in the fifth week. Among the topics in each forum, the proportion of topics with low replies (0 to 5) decreased significantly, and the proportion of topics with high replies (more than 5) had increased greatly beginning from ODF 5. This is because we implemented the second stage of the teaching intervention in the fifth week, which encouraged students to devote more in replying and interacting with others. Moreover, this trend remained basically stable after ODF 8, which suggests that the student interaction was basically stable during the third stage of intervention.

The density of the network increased significantly after the second teaching intervention, and remained stable during the third teaching intervention, which indicates that more and more students were interacting. More students participated into the online discussion, and the interaction between students increased greatly. This corresponds with the finding that BL approach to seminars facilitated student interaction with peers (Extavour, & Allison, 2018). The isolates dropped dramatically after the second teaching intervention, and also remained stable during the third teaching intervention, which means that the students who did not reply to any other students or to whom no student replied decreased after the second teaching intervention. Further, the indegree centralization increased significantly after the second teaching intervention, which indicates that there is a clear concentration trend among the students to whom others replied. That means that most students replied to a small number of students. There are no significant changes in the outdegree centralization, which indicates that the total number of posts per student changed little during the 14 ODFs. However, the density of ODF 14 decreased and the isolates increased unexpectedly, which may be due to the fact that students were not anticipating another class meeting and were preparing for final exams.

The total number of students' replies can be taken as a sign of their enthusiasm for participating in the interaction. After the fourth week, the total number of students with 0-1 reply decreased greatly; the total number of students with 2 replies decreased slightly; However, the total number of students with 3-5 replies increased significantly. Moreover, among the 14 discussions, the total number of students with more than 5 replies was very few and remained stable. It appears that the interventions in the course had little impact on the students with high interaction enthusiasm. However, for those students with low interaction enthusiasm, the teaching interventions made them more involved in replying and interacting with others. Students who had not participated actively (with 2 or fewer replies, which was just in line with or even not complying with the requirements) began to participate actively and exceed the course requirements. This suggests the course enhanced the enthusiasm of students to participate in the interaction. However, it contrasts with the work of

Knowlton (2005), who found that students seek to meet minimum standards rather than actively participate and reflect freely on others' contributions.

Meanwhile, we carried out three stages of teaching interventions in the course and achieved good results. The evidence presented in the Wilcoxon test shows significant difference between students' perceptions of subjects understanding before and after the class. The negative Z values means that there is a strong and positive influence on students' perceptions of understanding after class. This suggests students' perceptions of subject understanding was enhanced significantly through BSS, which corresponds with the finding that students felt attending seminar can help in understanding the topic better (Gajbhiye, Tripathi, Jalgaonkar, & Sarkate, 2014).

Most students learned the materials available in the course and accessed extracurricular learning materials by themselves. The majority of students read most or even all of these learning materials available in the course, except for the posts on the Daxia platform. There were a large number of posts in each forum, yet more than half of the students read most or even all of the posts. What's more, the majority of students always accessed or sometimes accessed other learning materials actively which were not provided in the class. And most students were very dedicated to the course (more than 80%). This suggests that students were learning actively in the course.

CONCLUSIONS

BL in seminars is a novel and valuable approach for engaging students (Extavour, & Allison, 2018). Traditional offline lectures involve a large number of students. This means that, due to time restrictions, students do not interact very much. We designed a new BSSC to teach Educational Technology Frontier course in a university in China, blending traditional offline lectures and online discussions in a seminar series. The BSSC achieved good results. And it promotes students to participate in interaction and students show a high level of enthusiam in interaction. Students were learning actively in the BSSC. The BSSC enhances their perceptions of understanding of course subjects.

The current study has several limitations. Firstly, the questionnaires we used to explore the students' perceptions were created by the teaching assistant. Although all the questionnaires were reviewed by the instructors, and were piloted prior to activation, the reliability and validity of the questionnaires still cannot be confirmed. We tested the Cronbach's Alpha of the questionnaires, which could ensure the reliability of the questionnaires to a certain extent. Secondly, this was an exploratory study of how a BSS affected students' interaction and perceptions. No control group was available to determine the casual effects of the course design on the units of measure. Thirdly, the reporting of students might be biased because they would be primed to say what they think the person grading them wants to hear. Finally, the study heavily relied on quantitative methods. A mixed methods approach could be used in the future. For example, we might conduct content analysis with the posts in ODFs as an alternate way to explore their knowledge level and interaction patterns.

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