

The Effect of Using Online Discussion Forums on Students' Learning

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ABSTRACT

This study was conducted to investigate the effect of using online discussion forums (ODFs) on students' learning, particularly on their achievement. In order to achieve this, a quasi-experimental design was implemented during one academic semester at one of the leading universities in Saudi Arabia. The sample of this study involved undergraduate students (N = 138) divided into two groups: the experimental group involved 67 students and the control group involved 71 students. The findings indicate that using ODFs is likely to lead students to gain a better achievement. In addition, statistical analyses reveal significant and positive relationships between student participation in ODFs and their final course mark, but no significant relationships between their participation in ODFs and grade point average. The social interaction and the collaborative nature in ODFs environments as well as the active learning in blended learning courses were likely to be the possible reasons for the increased achievement when students utilise ODFs to enhance traditional learning. However, contextual dimensions need to be given a great deal of attention in order to find satisfactory results.

Keywords: Online discussion forums (ODFs), achievement, higher education, Saudi Arabia.

INTRODUCTION

Online discussion forums (ODFs) are widely implemented in university contexts as an important part of the teaching and learning process (AlJeraisy, Mohammad, Fayyoumi, & Alrashideh, 2015; Andresen, 2009; Blackmon, 2012; Chang, Chen, & Hsu, 2011; He, 2012; McNamara & Burton, 2009). Recently, ODFs have been used in many Saudi universities to supplement traditional learning classes (Hamdan, 2014b), that is in blended learning courses. The social online environment in which ODFs are integrated into traditional learning classes could be considered as an application of the social constructivism theory. Vygotsky (1978) considered learning to take place socially, in a social context, and develop through relationships with other students before it is internalised inside the student. Vygotsky (1978) posited that social interaction is a crucial requirement for full cognitive development. According to Al-Ibrahim and Al-Khalifa (2014), the social constructivism theory is "applicable to all educational contents and activities" (p. 1). They reported that online discussion in a social environments "promotes the development of communication and social skills and encourages dialogue and collaboration between students as found in social constructivism theory" (2014, p. 1). Pedagogically, in traditional learning, discussion is mostly led by academic staff as teacher-centered learning represented in the lectures, but discussion in ODFs could be led by students in most cases, then the role of academic staff becomes one of facilitator in student-centered learning.

Interestingly, Alamri, Cristea, and Al-Zaidi (2014) found that Saudi students prefer to work collaboratively and they appreciate their peers' advice to improve their learning. Alamri et al. (2014) revealed that students are likely to have positive intentions towards using ODFs because the use of ODFs supports social interaction and teamwork. Importantly, they found that collectivism has a significant positive influence on a student's perception of learning (Alamri et al., 2014). Holmes, Tracy, Painter, Oestreich, and Park (2015) asserted that collaborative discussion occurs in traditional learning and extends in ODFs increasing active knowledge acquisition, because using ODFs can engage students in active learning. In ODFs, "engaged students are mentally involved in their learning through deep thinking and interactive activities and educational experiences" (Salter & Conneely, 2015, p. 18).

Because of the social interaction and the collaborative environment, using ODFs can have a positive effect on students' learning in the Saudi higher education context (Al-Ibrahim & Al-Khalifa, 2014; Alamri et al., 2014; AlJeraisy et al., 2015; Ismail, Mahmood, & Babiker, 2013). For example, Ismail et al. (2013) examined the differences in the students' degree of participation between the online lab which utilises ODFs and the traditional computer lab. They found that students in the online lab performed significantly better, in terms of their degree of participation, than the students in the traditional lab. Importantly, Ismail et al. (2013) highlighted that using

ODFs improved the students' learning skills and the relationships among them due to the collaborative nature of the work in the ODF environment. Most recently, AlJeraisy et al. (2015) found that students with access to ODFs had socially influenced their peer group slightly more than those students who had no access to ODFs, although both groups were using the learning management system: Moodle. They also found that using ODFs made students more confident about their performance and more active and participative with other tools within the Moodle. AlJeraisy et al. (2015) added that students who had access to ODFs "felt the interaction and collaborative experience to be a positive one that helped increase their knowledge and understanding of the course material" (p. 256).

LITERATURE REVIEW

The effect of using ODFs on students' achievement

Student achievement is the ultimate goal of the educational process. Achievement can be defined as the grade that students obtain on their achievement tests. The effect of using ODFs on students' achievements is well recognised. Previous research demonstrated that using ODFs can have a positive effect on student achievement (Jacob, 2012; Koole, Vervaeke, Cosyn, & De Bruyn, 2014; Shana, 2009; Wei, Peng, & Chou, 2015; Xia, Fielder, & Siragusa, 2013).

In the Saudi higher education context an early investigation that was conducted by Al-Jarf (2002, 2004a, 2004b, 2005b, 2006) at King Saud University showed that using ODFs with Saudi female students had a positive effect on their English language achievement. In particular, she found that students who used ODFs performed significantly better in their exams, in terms of writing achievement (2002, 2004a, 2004b), grammar achievement (2004a, 2005b) and cultural awareness achievement (2004a, 2006) than students who did not use them. Alghamdi (2013) investigated the pedagogical implications of using ODFs within the Blackboard for the learning improvement of female students who were enrolled in a professional development and competencies course at a private university. She revealed that the students in the experimental group scored higher than those in the control group on the post achievement test. By providing examples, Alghamdi demonstrated that students in the experimental group had more understanding of course concepts and were more able to discuss various topics. Alghamdi (2013) concluded that "the use of online discussion as a supplement to in-class discussion improves students' achievement and learning in higher education, at least in this particular context" (p. 74). Most recently, AlJeraisy et al. (2015) investigated the impact of using ODFs on students' achievement at a private university studying a course in the Faculty of Business Administration. The study involved 60 students divided equally into two groups, whereby both groups were using Moodle. Online discussion forums (ODFs) were only available to the experimental group. They found that the group with access to ODFs scored significantly higher on the studied unit exam than the group without access to ODFs. In addition, the students who had access to ODFs were more confident about their performance in terms of exam results as a great percentage of them rated their expectations as either very good or excellent.

These studies indicated that using ODFs was likely to be the reason for the increased levels of student achievement. However, with the exception of AlJeraisy et al.'s study (2015) in which the students' gender was not identified, these studies were limited to female students. Al-Jarf's studies (2002, 2004a, 2004b, 2005b, 2006) were conducted for English courses at a single public university, whereas the studies of Alghamdi (2013) and AlJeraisy et al. (2015) were conducted for business courses at private universities. It also appears that English was the medium of instruction for the courses that utilised ODFs in these studies. However, when the medium of instruction is in the Arabic language, the use of ODFs seems to be more important. Lack of adequate English language proficiency for students was one of the barriers to adopting e-learning in Saudi universities, even when they were studying in an English context (Mayan, Sheard, & Carbone, 2014).

Student participation in ODFs and their achievement

Participation in ODFs means the ability of students to write initial posts, such as writing a new topic/thread, and to respond to academic staff and other students' posts as reply posts. Students who only read other student posts without making any contribution to the online discussion are known as lurkers, as described by several researchers (e.g., Knowlton, 2005; Palmer & Holt, 2010; Zhu, 2006). Participation is also termed to be interaction, and interchangeably appears to be used with other terms such as communication, engagement and involvement (AlJeraisy et al., 2015; Jordan, 2011). The relationships between participation in ODFs and students' achievements have been investigated by many researchers (Al-Jarf, 2004a, 2005b, 2006; Alghamdi, 2013; AlJeraisy et al., 2015; Buckley, 2011; Canal, Ghislandi, & Micciolo, 2015; Carceller, Dawson, & Lockyer, 2013, 2015; Hartnett, 2012; He, 2012; Koole et al., 2014; Palmer & Holt, 2010; Palmer, Holt, & Bray, 2008; Song & McNary, 2011). In particular, the correlation between the number of times students participate in ODFs and the students' final course mark or an activity that ultimately contributed to the students' final course mark.

However, the literature review showed mixed findings for the relationship between student participation in ODFs and their achievement. For example, while in the same context AlJeraisy et al. (2015) found significant relationships between the number of times students participate in ODFs and their achievement, similar findings in other contexts were reported by Carceller et al. (2013, 2015), Koole et al. (2014), Palmer and Holt (2010) and Palmer et al. (2008). Interestingly, it was found that students who actively participated in ODFs were likely to achieve a higher final course mark, and this was more marked in a blended learning than in fully online learning environments (Carceller et al., 2013, 2015). These findings consistently confirmed that student participation in ODFs did contribute significantly to their achievement. In contrast, no significant relationships were found in Song and McNary's study (2011). It should be highlighted that, while the majority of previous studies that have found significant correlation were conducted with undergraduate students, Song and McNary's study was conducted with postgraduate students, and that little variation in students' grades was reported (Song & McNary, 2011). However, a mixture of different relationships was found among undergraduate students in the same context by Alghamdi (2013) and elsewhere by Hartnett (2012).

Arguably, these mixed findings are likely to be attributable to situational dimensions. In Alghamdi's study, although the students had gained prior experience at using learning management systems, particularly Blackboard, but not with ODFs, the mixed relationships are likely to be attributable to the voluntary basis of participation, even though extra marks were given, and to the limited time students had to give to participation (Alghamdi, 2013). In the Saudi higher education context, students are not likely to engage in an online activity that does not officially contribute to the final course mark (Al-Jarf, 2005a). A lack of time also has been identified as one of the main barriers for university student participation in ODFs in Saudi Arabia (Alebaikan, 2010) and internationally (Birch & Volkov, 2007; Cheung, Hew, & Ling Ng, 2008; Hew & Cheung, 2010; Pena-Shaff, Altman, & Stephenson, 2005), particularly with worker students (Wilkinson & Barlow, 2010). Hew and Cheung (2010) found that the student decision to participate in ODFs depended on the availability of time they had. In addition, it can be argued that the mixed relationships in Hartnett's (2012) study are likely to be attributed to the different instructional design used within each case study. The significant relationship was found in the case study in which students were required to work collaboratively and to complete the task together within a six week period; in addition to that, a high weighting (60%) was dedicated towards their final mark. In other words, participating online was essential. However, this was not the case with the other case study where a lack of any significant relationship was found. In this case study, students were required to work individually, to complete the task more independently within a four week period, and then to participate online wherein a lower weighting (40%) was dedicated towards the final mark. In other words, participation was not directly linked to collaboration with others. This indicates that the different nature of the tasks within each case study was likely to be the possible reason for the contradictory results found by Hartnett (2012).

Interestingly, individual differences may also influence student participation in ODFs, and therefore influence their achievement. Students' prior academic performance, as measured by grade point average (GPA), was found to be an influential dimension that positively affected their participation in the ODF environment. That means good students are likely to participate actively in ODFs and to complete their course, having sent a higher number of posts. For example, He (2012) found that "students who actively participate in online discussion have good academic performances" (2012, p. 854) in which their GPAs were greater than 3.4/4. In other words, students who have high academic performance are likely to participate more than students with lower academic performance. This also highlights another point of view: that good students are likely to engage more with ODFs because they engage with all forms of learning and therefore submit a higher number of posts. To sum up, it is evident that contextual influences play a critical role in determining whether any significant relationships can be detected. Thus, it is fundamental to take into account consideration of such influences mentioned above when implementing ODFs in the higher education context.

RESEARCH QUESTIONS

This study aimed to investigate the effect of using ODFs on students' learning, particularly on their achievement by fulfilling the following research questions:

Q1- What is the effect of using ODFs on students' achievement?

Q2- What is the relationship between student participation in ODFs and their final course mark?

Q3- What is the relationship between student participation in ODFs and their prior grade point average?

SIGNIFICANCE OF THE STUDY

The use of online discussion forums (ODFs) is not innovative in itself, but blending online discussion to extend traditional learning is a new approach in the Saudi higher education context. Recently, the majority of Saudi public universities have paid a great deal of attention to the adoption of new ICT tools for teaching and learning (Alharbi & Drew, 2014). As this study intends through its findings to enhance traditional learning by providing

more effective learning environments, this change in teaching approaches creates concerns about whether discussion in an online learning environment will enhance the learning process. Determining the effect of using ODFs, and how successful the implementations of it could be, is crucial prior to actual adoption. For this reason, gaining further understanding of the use and effect of ODFs is worthwhile.

METHODOLOGY

Design and sampling

A quasi-experimental design was employed for this study in which existing groups were utilised (Creswell, 2012). One of the leading public universities located in the Western Region of Saudi Arabia was selected as the site for this study for reasons of both typicality and convenience. It is broadly typical of many such Saudi institutions and it was also the author's primary place of work, which made access easier to arrange. In this study, convenience sampling was instituted which ended with a sample of three academic staff and 138 students from six classes who agreed to take part in this study during semester one, 2013-2014. The 138 students were enrolled at the Faculty of Education and had identical characteristics as they were undergraduates, studying full time on campus, males, and Saudi citizens. The majority of them (135) were studying Special Education whereas three students in the experimental group were studying Quranic studies. The grade point average (GPA) of the experimental group students (67) was as follows: 22 students had good GPAs, 43 students had very good GPAs and two students had excellent GPAs.

Course design

The 138 students involved in this study were enrolled in six classes, studying three different courses in educational technologies department. The students were divided into two groups: the experimental group involved 67 students within three classes and the control group involved 71 students within the other three classes. Each class of students in the experimental group was studying the same course as their counterpart in the control group, and was taught by the same academic staff member. The experimental group students were taught and then asked to participate in ODFs as blended courses, whereas the control group students were taught the same course and followed the same teaching method, but were not required to participate in ODFs. That means, in addition to the traditional class discussion, the experimental group students were exposed to an online discussion in an ODF for the same content as a supplementary pedagogical tool alongside their face to face classes, which was not the case for the control group students. Both groups, therefore, used the same textbooks and were exposed to the same content and instruction in the traditional classes. Thus, the grading scheme was the same for both groups.

Pre/post achievement tests

Achievement tests are defined as those tests “designed to measure the degree of learning that has taken place after a person has been exposed to a specific learning experience” (Johnson & Christensen, 2014, p. 181). In this study, pre/post achievement tests were designed by the three academic staff accompanied with answers guides. Since they were teaching different courses, these tests were different. Moreover, these tests involved different types of formats, such as true/false, multiple choice and fill-in. In addition, they were formulated in the Arabic language since all students who were involved in this study were Arabic native speakers. These tests were the same tests that were being used in the normal courses, which should have addressed the threats to the tests' validity and reliability. This is because the design of each test was considered by some academic staff in the department, those who teach the same courses and was modified over time. The administration of these tests was conducted by the author with the supervision of the three academic staff at a time of 10 minutes for each test. These tests were implemented as a traditional test - in paper-and-pencil format – and were marked by the author.

Online discussion forums (ODFs)

Typical ODFs were designed in Arabic language for this study. This was achieved with a Saudi design company named the TXT Company for Integrated Web Solutions and Services (www.txt-txt.com.sa). This company was also responsible for hosting and providing 24 hour technical support to the ODFs. A consistent style was used in the design of the three ODFs, so that it was clear and easy to follow and navigate within. There were many features of the style; however, the most obvious one was the ability to change the style colour. The participants were able to choose the preferred colour from four colours: dark purple, green, blue and red. The default colour of the style was blue, with that decision having been made after consulting the three academic staff.

The content of the ODFs was related to the courses of study. Each ODF contained the relative course content. No advertisements were used, unlike in many ODFs, in order to encourage the students to focus on the course content without any distraction. The management of the ODFs was administrated by the author, which also has given the students an instructional session for each class in the experimental groups regarding the use of ODFs, including how to log in, view posts, create initial posts, reply to posts, format posts and upload materials. Since

the three academic staff members were from the Department of Educational Technology, they were sufficiently capable and experienced in using ODFs. In particular, there were three ODFs, and each one had ten forums for ten weeks of topics, so that each week had a special forum regarding a specific topic for that week. In the instructional session, students were provided with an instruction sheet for writing posts that was derived from previous studies (e.g., Jordan, 2011; Lee, 2009; Palmer & Holt, 2010). In addition, students were provided with an assessment rubric that was derived from previous studies (e.g., Edelstein & Edwards, 2002; Kleinman, 2005; Nandi, Hamilton, & Harland, 2012). The students were required to complete two tasks in the ODFs, which were adopted from previous studies (e.g., Palmer & Holt, 2010; Palmer et al., 2008). There was also an assessment sheet for academic staff, which was adopted from Baker’s study (2011) with minor additions and completed by the author anonymously every week with no engagement with students. This was due to the high workload of the three academic staff which hindered their ability to take part in this role. However, participation was voluntary. Moreover, each experimental group had a separate online forum that had a unique link, so that students from other experimental groups could not register and participate in the forums that were not assigned to them. In addition, as ODFs require that a user registers and creates a password, each student registered using a code; the first three letters of the father’s name followed by the last three numbers of the student ID. Therefore, registration was anonymous.

DATA ANALYSIS PROCEDURES

To facilitate the analysis procedures, the Statistical Package for Social Sciences (SPSS) version 20 and Microsoft Excel were used. The achievement tests data were initially entered into Excel files. Then the data were coded and entered into the software package SPSS. In case of the experimental groups’ students, the same ID code that had been used to register in the ODFs for each participant was also used as the ID code for the achievement tests. In the case of the control groups’ students, each participant was given an ID code from 01 through to 71. After that, analytical procedures including independent samples t-tests and paired samples tests were conducted to examine the differences between the two groups. The ODFs data were analysed quantitatively based on the number of initial postings and reply postings when students finished the courses at the end of the semester. As quantitative analysis was conducted to analyse the data of ODFs, there was no need to transcribe the Arabic content into English. The data were initially entered into Excel files. Then the data were coded and entered into the software package SPSS using the same registration ID code in ODFs for each student. After that, descriptive analyses were conducted, such as the total number of initial and reply posts, to describe student participation in the ODFs. In addition, the relationships between the statistical data of ODFs and students’ achievement were examined. In this study, the significance level at 0.05 was applied. According to Field (2009), when the “observed significance is less than .05, then scientists agree that the result reflects a genuine effect” (p. 208). Johnson and Christensen (2014) added that “most educational researchers use .05 as the significance level” (p. 567).

RESULTS

Pre/post achievement tests analysis

The 67 students in the experimental groups were studying by using ODFs alongside traditional learning, while the 71 students in the control groups were studying by traditional learning alone. Both groups completed the pre/post achievement tests in three undergraduate courses. In regard to the pre-achievement test results, conducting the independent samples t-test shows no significant differences between the pre-achievement test mean scores of the experimental and control groups, indicating no significant differences in the background knowledge of the three courses between the groups before the experiment ($t = .028$, $df = 136$, $p = .978$). Moreover, the student grade point averages (GPAs) were collected to examine whether there were any significant differences in their general ability. The experimental group had higher mean score ($M = 3.61$) than the control group’s mean score ($M = 3.49$). However, the independent samples t-test revealed that this was not statistically significant ($t = 1.788$, $df = 136$, $p = .076$). After that, the effect of each learning method was examined by using the paired sample t-test, as is shown in Table 1.1.

Table 1.1: Achievement Tests’ Results of Students

Group	Test	Group statistics				Paired samples test		
		N	M	SD	SE	T	df	Sig. (2-tailed)
Experimental group	Pre test	67	10.09	3.460	.423	-6.543	66	.000*
	Post test	67	12.05	2.844	.347			
Control group	Pre test	71	10.07	3.178	.377	-3.861	70	.000*
	Post test	71	10.96	3.053	.362			

* $p < .05$.

The results in Table 1.1 reveal a significant difference between the pre/post achievement test mean scores of the experimental group at the .05 level ($t = - 6.543$, $df = 66$), suggesting that experimental students’ achievement was significantly improved as a result of exposure to a combination of traditional learning and the use of ODFs. Similarly, a significant difference between the pre/post achievement test mean scores of the control group was found at the .05 level ($t = - 3.861$, $df = 70$), suggesting that achievement in the control group was significantly improved as a result of studying through traditional learning alone, which depended on the oral and PowerPoint presentations only. However, the paired t-test results do not show which group made higher gains. Therefore, the independent samples t-test was used to examine the differences of the post achievement tests between the experimental and control groups, as is shown in Table 1.2.

Table 1.2: Post Achievement Test Results of Students

Group	Group statistics				Levene's test		T-test for equality of means		
	N	M	SD	SE	F	Sig.	T	df	Sig. (2-tailed)
Experimental group	67	12.05	2.844	.347	1.758	.187	2.168	136	.032*
Control group	71	10.96	3.053	.362					

* $p < .05$.

The test results in Table 1.2 indicate significant differences between the experimental and control groups post achievement tests mean scores in the three courses ($t = 2.168$, $df = 136$, $p < .05$), suggesting that achievement in the experimental group was higher than in the control group at the end of the semester as a result of using ODFs alongside traditional learning. To conclude, the experimental group students had a higher achievement outcome score than the control group students.

Online discussion forums (ODFs) analysis

The students in each experimental class were supposed to complete 10 threads by submitting two weekly posts per student during 10 weeks of study. Table 1.3 shows the descriptive data of the three ODFs.

Table 1.3: Descriptive Data of Student Participation in ODFs

Class	N (%*)	Total number of			
		Threads N (%**)	Initial posts N (%**)	Reply posts N (%)	Posts N (%)
Class A	16 (23.88)	7 (70.0)	68 (42.5)	71 (44.38)	139 (43.44)
Class B	31 (46.27)	9 (90.0)	124 (40.0)	124 (40.0)	248 (40.0)
Class C	20 (29.85)	10 (100)	82 (41.0)	75 (37.5)	157 (39.25)
Total	67 (100)	26 (86.67)	274 (40.9)	270 (40.3)	544 (40.6)

* These percentages are out of the total number of participants. ** These percentages are out of the total number of the required threads that was 10 threads per class (e.g., students in Class A participated 70% of the required threads) or the required posts, that was one initial post and one reply post per participant weekly (e.g., students in Class A submitted 42.5% of the required initial posts, that was 160 initial posts).

Table 1.3 shows that the three classes did not complete the required tasks in terms of the total number of threads, with the exception of Class C. It is noteworthy that none of the three classes had even completed half of the required number of posts. Although the lowest number of students was in Class A, who had the lowest proportion in terms of the completed threads, they had the highest proportion in terms of the submitted posts in ODFs. Thus, this class was the most active class, whereas Class C was the least active class. In addition, the number of students between the three classes was unequal and had a positive relationship with the total number of posts. The number of the weekly posts was also mixed within each class and between the three classes, as is shown in Figure 1.1.

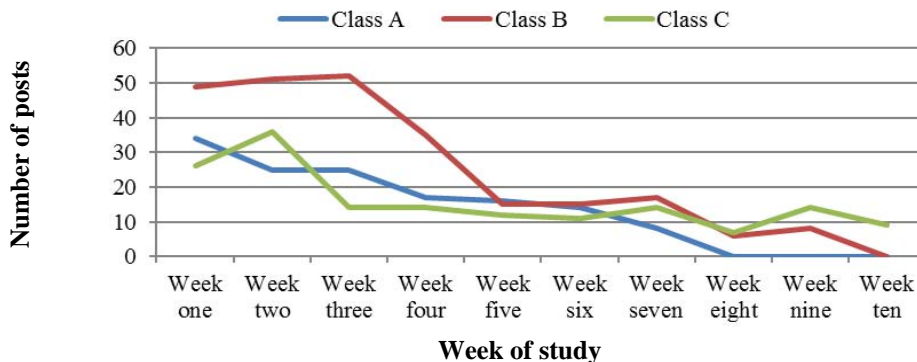


Figure 1.1: The number of students’ weekly posts in ODFs

Figure 1.1 shows that the students were participating actively in the first three weeks of study and that a dramatic decrease was noticed after that, especially for Class B and Class C, until week five. At mid semester, during weeks five and six, students from the three classes were participating quite equally. It should be noted that the students had an official vacation during these two weeks. Interestingly, the fluctuations in the number of the weekly posts had a similar shape for Class B and Class C during the 10 weeks of study.

Statistical data from the three ODFs reveal that the most active student made 29 posts from Class C followed by another two students who made 25 and 19 posts from the same class during the 10 weeks; whereas three students from the same class were seen as lurkers as they did not make any contributions. It was also noticed that students were trying to do only the two required posts each week, particularly in the first three weeks when the majority of students were participating in the ODFs. In addition, two academic staff registered in the ODFs without making any contribution and the third one did not register at all. This means that the three academic staff did not engage with their students in the ODFs. It was also noticed that the students used some of the features of the ODFs. Most of the students edited their posts properly, as they used punctuation and the numbering of points as well as using different features of the ODFs editor, such as colour, font style and size. They also used some of the ODFs icons to express their emotions and to motivate each other.

Relationships between participation in ODFs and achievement

A linear regression analysis was used to investigate the relationships between student participation in online discussion forums (ODFs) and their achievement, as is shown in Table 1.4.

Table 1.4: Relationships between Participation in ODFs and Achievement

Independent variable	Dependent variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig	R ²
		B	Std.Error	β			
Number of initial posts	Final course mark	0.67	0.19	.41	3.57	.00	.16*
Number of replies posts		0.84	0.19	.48	4.37	.00	.23*
Total number of posts		0.40	0.10	.45	4.11	.00	.21*
Grade point average	Number of initial posts	2.09	1.10	.23	1.90	.06	ns.
	Number of replies posts	1.52	1.04	.18	1.46	.15	ns.
	Total number of posts	3.60	2.06	.21	1.75	.09	ns.

* $p < 0.05$. ** ns.: The regression model was not significant ($p > .05$).

The results of the singly regression analysis models in Table 1.4 show that all relationships with the final course mark were found significant. In particular, the results show that significant and positive direct relationships were found between student participation in ODFs and their final course marks with β value ranged from .41 to .48, and that each regression analysis model explained about 20% of the observed variance in students' final course marks. It should be highlighted that the aim of this study was to investigate the effect of the student participation in ODFs on their final course marks as an indicator to its effect on their achievement, although there are many dimensions that are likely to affect their final course marks. Thus, the effect on student participation in ODFs by 20% as a single dimension was not considered slight. The β values indicate that the number of posts did significantly predict higher final course mark. Overall, these results suggest that higher participation in ODFs may lead to higher final course mark, especially for the replies posts ($\beta=.48$). However, there were no significant relationships between student participation and their prior grade point average (GPA). This indicates that students are likely to participate in ODFs equally regardless of their prior academic performances.

DISCUSSION

The results of the pre and post achievement tests, as well as the statistical data from online discussion forums (ODFs) represented in the number of posts, reveal that using ODFs was likely to be the reason for the significant increase in the experimental group students' achievements. In regard to the achievement tests, student results in Table 1.2 indicate that there are significant differences between the experimental and control groups post-achievement mean test scores. It suggests that achievement in the experimental group was significantly higher than in the control group at the end of the semester, although the control group had significant improvement due to the effectiveness of traditional learning as well (see Table 1.1). This significant finding indicates that using ODFs alongside traditional learning classes may lead to higher student achievement, which is consistent with a number of other studies that have indicated that using ODFs can have a positive effect on student achievement in the same context (Al-Jarf, 2002, 2004a, 2004b, 2005b, 2006; Alghamdi, 2013; AlJeraisy et al., 2015) and in other contexts (Jacob, 2012; Koole et al., 2014; Shana, 2009; Wei et al., 2015; Xia et al., 2013). However, in comparison with the previous studies in the same context mentioned above, the present study seems to be the first study that has investigated the effect of using ODFs on male students' achievements at a public university in

the Western Region area of the country. Additionally, it appears to be the first study that has applied the use of ODFs for Arabic courses within the Faculty of Education. More importantly, the majority of previous research in the same context utilised ODFs within different platforms of learning management systems, such as Blackboard and Moodle, in which other tools within these systems may have had a potential impact on the positive results that were found. In contrast, students in the present study utilised public ODFs that had been designed for this purpose and there were no other tools available to them. There were also no announcements about the blended learning course or to motivate students to participate in ODFs. In other words, although the utilised ODFs in the present study may lack formality because they were not part of the official learning management systems within the university's system, they yielded a positive effect on student achievement which is likely to be genuinely attributable to the utilisation of ODFs.

In regard to the number of posts and achievement levels, the results in Table 1.4 show there were no significant relationships between the student participation in ODFs and their prior grade point average (GPA). This does not only indicate that good students are more likely to participate actively in ODFs, but an equal participation is suggested. This finding is consistent with the work of Pena-Shaff et al. (2005), who found that ODFs “allowed all students the same opportunity to participate and communicate their thoughts” (p. 418). However, it contrasts with the work of He (2012), who found that students with previously above average academic performance were more likely to participate actively in ODFs. Although student academic performance was not reported in He's study (2012), the results of the present study show that the majority of students had very good GPAs, so that the meagre variation in their GPA values in general was likely to be the reason for the lack of significant relationships with their participation level, or it might be that students were participating equally in ODFs regardless of their prior academic performance.

However, there were significant and positive relationships between student participation in ODFs and their final course mark (see Table 1.4). The results of the regression analysis models in Table 1.4 show significant and direct positive relationships between student participation in ODFs and their final course mark, indicating that higher participation in ODFs is likely to lead students to achieve a higher final course mark. This finding is consistent with some of the previous research that has found that the number of posts is positively correlated with the final course mark. While similar relationships were found in the same context (AlJeraisy et al., 2015) and elsewhere (Carceller et al., 2013, 2015; Koole et al., 2014; Palmer & Holt, 2010; Palmer et al., 2008), the findings of Song and McNary (2011) suggested no correlation between the number of posts and students' final course mark. Moreover, mixed relationships were found in the same context (Alghamdi, 2013) and elsewhere (Hartnett, 2012).

These mixed findings of previous studies indicate a complex relationship between student participation in ODFs and their final course mark that is sensitive to contextual dimensions. It can be argued that the lack of any significant relationship in Song and McNary's study was due to the implementation of ODFs in “a graduate level course and there was little variation in students' grades” (Song & McNary, 2011, p. 12). While it seems that the majority of previous studies and the present study have found this association with undergraduate courses. Similarly, Bye, Smith, and Rallis (2009) confirmed that using ODFs with graduate courses did not result in better course grades. Students in this study were all undergraduates, in which they are likely to study more courses than postgraduates, which in turn is likely to make their grades more varied. The mixed relationships found in Alghamdi's study (2013) were likely to be attributed to the unofficial assessment and the lack of time, but student participation in the present study was voluntary and the lack of time appeared to be a serious issue for them. The majority of them were participating in the evening as observed in the statistical data in ODFs which might be due high student commitments. Students in the present study also had similar instructional design in the traditional and blended courses, but using different instructional design in the internet-based courses was likely to be the potential reason behind the inconsistent relationships in Hartnett's study (2012). In other words, it appears that the relationship between student participation in ODFs and their final course mark is correlational, depending on contextual dimensions.

Consequently, it is not possible to definitively conclude that participation in ODFs leads to significantly higher achievement. The findings of the present study provides some evidence to support this assertion, but it is likely that the students would have achieved satisfactory final course marks regardless of whether ODFs were utilised in this study. However, there are many possible reasons for the significant findings found in the present study, as follows. The social interaction and the collaborative nature in ODFs environments were likely to be a possible reason for the significantly increased achievement levels of the experimental group students. Students in the present study had no prior online educational experience which demonstrated that using ODFs in educational contexts was a new experience. This may be due to the prevalence of traditional pedagogical practises in this particular university, confirming the assertion of traditionalism of pedagogical practises in the Saudi universities

by previous research (e.g., Al-Zahrani, 2015; Alebaikan & Troudi, 2010; Colbran & Al-Ghreimil, 2013; Hamdan, 2014b). In other words, a lecture-based classroom seems to be the main teaching method used by academic staff that is likely to lack social interaction and collaboration between the students. In contrast, Saudi students have been found to prefer to work collaboratively and appreciate their peers' advice to improve their learning, and that collectivism has a significant positive influence on their perception of learning (Alamri et al., 2014). Thus, engaging in ODFs was likely to be a great opportunity for students to improve their learning in a new learning experience that was a blended learning course, and in turn this perhaps helped them to understand the course more thoroughly and, ultimately, to achieve higher grades. This finding is consistent with previous research in the same context that has indicated that the social interaction and the collaborative nature of ODFs has a positive effect on students' learning (Al-Ibrahim & Al-Khalifa, 2014; Alamri et al., 2014; AlJeraisy et al., 2015; Ismail et al., 2013).

In practice, although the submission of the two weekly posts in the ODFs was an individual task, the completion of the tasks was based on the collaboration arrangement between the students, which may also have encouraged them to interact more socially. For the first task, students were required to submit different initial posts, so they had to read all others' posts and then participate in the ODFs. In the second task, they were required to comment on their peers' posts. In other words, they could not complete the tasks individually, especially the second one and for later posting students in case of the first task, without depending on their peers' contribution. In other words, intentionally and unintentionally, all students worked collaboratively and socially.

One possible reason for this was likely to have been the active learning in blended learning courses. Although the experimental and control group students used the same textbooks and were exposed to the same content and instruction in the traditional and blended courses by the same academic staff, the experimental group students had another way of dealing with content. Students were engaged in different forms of learning, traditional learning in class and participating in ODFs, which in turn possibly lead them to more active learning. This is supported by the work of Carceller et al. (2013, 2015), who found that students' participation was significantly correlated to students' achievement in blended learning environments more than in fully online learning. This means that engaging students in different forms of learning is likely to lead to a better achievement (Shana, 2009). Using ODFs in blended learning courses "can be engaging learning activities" (Salter & Conneely, 2015, p. 18) and, therefore, can engage students in active learning (Holmes et al., 2015). In the same context, AlMahamoud and Elebiary (2013) found that students' higher achievement is most likely to be "impacted by the more active classroom teaching approach utilized in the blended course format" (p. 4658), and that blended learning contexts can make students active (AlJeraisy et al., 2015; Hamdan, 2014a). A number of studies in the same context also indicated that students' achievement was found to be better in blended learning environments over traditional learning environments, and even over the e-learning environments (e.g., Al-Qahtani & Higgins, 2013; AlMahamoud & Elebiary, 2013; Alseweed, 2013; Riad, Saadat, & Badawy, 2013). These indicators to the benefits of active learning in blended learning environments are likely to be a justifiable reason for the significantly higher achievement of the experimental group students over their counterparts in the present study.

LIMITATION AND FUTURE DIRECTIONS

The scope of this study was limited to undergraduate students at a single university due to the accessibility and time issues. In addition, the high workload prevented the academic staff in the present study to engage with the students in the online discussion. Accordingly, academic staff involvement in ODFs clearly needs to be investigated, not only because that did not happen in the present study and apparently in previous studies in the Saudi higher education context, but also due to the crucial role they play in ODFs (Al-Fahad, 2010; AlJeraisy et al., 2015; An, Shin, & Lim, 2009; Andresen, 2009; Hew & Cheung, 2010; Pena-Shaff et al., 2005; Sebastianelli, Swift, & Tamimi, 2015; Swan, 2001). Additionally, it seems that there is more to student engagement in ODFs than simply their participation. That is the quality of participation in ODFs. Naranjo, Onrubia, and Segué (2012) have argued that participation "is a necessary but not a sufficient condition for maintaining high-quality contributions throughout the discussion" (p. 282). Student participation can vary widely from very shallow postings to deeply reflective postings on the topics under discussion (Warren, 2008). The quality of student participation in ODFs is well documented (see e.g. Akyol & Garrison, 2011; Hew & Cheung, 2010; Linjawi, Walmsley, & Hill, 2012; Lloyd, 2011; Naranjo et al., 2012), but it seems that there is a scarcity of studies on this area in the Saudi higher education context. Thus, further studies to investigate the quality of student participation in ODFs are required within the Saudi higher education context. Finally, the assessment issue was not considered as it is beyond the scope of this study. Students' participations were relatively low (see Table 1.3) which might be due to the voluntary bases of participation. The importance of assessing student participation in ODFs in the Saudi higher education context is well recognised (Al-Ibrahim & Al-Khalifa, 2014; Al-Ismaiel, 2013; Al-Jarf, 2005a, 2005b; Alghamdi, 2013; Alkhalaf, Nguyen, Nguyen, & Drew, 2011, 2013). Thus, further research is

needed in order to explore the influence of both the voluntary and assessed bases of student participation in ODFs.

CONCLUSION

The findings of the achievement tests and the quantitative data of student participation in ODFs suggest that using ODFs to enhance traditional learning may contribute to students' achievement, particularly when students are engaged in ODFs effectively and efficiently. This is possibly because using ODFs can allow students to participate equally, work socially and collaboratively, and engage in active learning. However, contextual dimensions need to be given a great deal of attention, because they can play a key role in determining the effect of using ODFs on students' achievement (Hartnett, 2012).

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REFERENCES

- Akyol, Z., & Garrison, R. (2011). Understanding cognitive presence in an online and blended community of inquiry: Assessing outcomes and processes for deep approaches to learning. *British Journal of Educational Technology*, 42(2), 233-250.
- Al-Fahad, F. N. (2010). The learners' satisfaction toward online e-learning implemented in the college of applied studies and community service, King Saud University, Saudi Arabia: Can e-learning replace the conventional system of education? *Turkish Online Journal of Distance Education*, 11(2), 61-72.
- Al-Ibrahim, A., & Al-Khalifa, H. S. (2014, November). *Observing online discussions in educational social networks: A case study*. Paper presented at the International Conference on Web and Open Access to Learning, Dubai, United Arab Emirates.
- Al-Ismaiel, O. A. (2013). *Collaborative blended learning with higher education students in an Arabic context*. Unpublished doctoral dissertation, University of Wollongong, Wollongong, New South Wales, Australia.
- Al-Jarf, R. S. (2002, June). *Effect of online learning on struggling ESL college writers*. Paper presented at the 23rd National Educational Computing Conference, San Antonio, Texas, United States.
- Al-Jarf, R. S. (2004a, November). *Differential effects of online instruction on a variety of EFL courses*. Paper presented at the 3rd Annual Meeting of the Asia Association of Computer Assisted Language Learning (AsiaCALL), Penang, Malaysia.
- Al-Jarf, R. S. (2004b). The effects of web-based learning on struggling EFL college writers. *Foreign Language Annals*, 37(1), 49-57.
- Al-Jarf, R. S. (2005a, November). *Connecting students across universities in Saudi Arabia*. Paper presented at the Annual Meeting of the Asia Association of Computer Assisted Language Learning (AsiaCALL), Gyeongju, South Korea.
- Al-Jarf, R. S. (2005b). The effects of online grammar instruction on low proficiency EFL college students' achievement. *The Asian EFL Journal Quarterly*, 7(4), 166-190.
- Al-Jarf, R. S. (2006, August). *Impact of online instruction on EFL students' cultural awareness*. Paper presented at the APETAU Conference, Amman, Jordan.
- Al-Qahtani, A. A., & Higgins, S. E. (2013). Effects of traditional, blended and e-learning on students' achievement in higher education. *Journal of Computer Assisted Learning*, 29(3), 220-234.
- Al-Zahrani, A. M. (2015). Challenges and obstacles to the effective integration of technology: A qualitative investigation of the policymakers perspective in Saudi pre-service teacher education. *Saudi Journal of Educational Technology Research*, 1(1), 1-12.
- Alamri, A. S., Cristea, A. I., & Al-Zaidi, M. S. (2014, July). *Saudi Arabian cultural factors and personalised elearning*. Paper presented at the 6th International Conference on Education and New Learning Technologies, Barcelona, Spain.
- Alebaikan, R. (2010). *Perceptions of blended learning in Saudi universities*. Unpublished doctoral dissertation, University of Exeter, Exeter, England, United Kingdom.
- Alebaikan, R., & Troudi, S. (2010). Blended learning in Saudi universities: Challenges and perspectives. *Research in Learning Technology*, 18(1), 49-59.
- Alghamdi, A. (2013). Pedagogical implications of using discussion board to improve student learning in higher education. *Higher Education Studies*, 3(5), 68-80.
- Alharbi, S., & Drew, S. (2014). Using the technology acceptance model in understanding academics' behavioural intention to use learning management systems. *International Journal of Advanced Computer Science and Applications*, 5(1), 143-155.

- AlJeraisy, M. N., Mohammad, H., Fayyoumi, A., & Alrashideh, W. (2015). Web 2.0 in education: The impact of discussion board on student performance and satisfaction. *The Turkish Online Journal of Educational Technology*, 14(2), 247-259.
- Alkhalaf, S., Nguyen, J., Nguyen, A., & Drew, S. (2011, December). *The potential role of collaborative learning in enhancing e-learning systems: Evidence from Saudi Arabia*. Paper presented at the Australasian Society for Computers in Learning in Tertiary Education Conference: Changing Demands, Changing Directions, Hobart, Tasmania, Australia.
- Alkhalaf, S., Nguyen, J., Nguyen, A., & Drew, S. (2013). Online learner satisfaction and collaborative learning evidence from Saudi Arabia. *International Journal of Information and Communication Technology Education*, 9(2), 66-78.
- AlMahamoud, S., & Elebiary, H. (2013, March). *Students outcomes & satisfaction in classical & blended courses: Comparison study*. Paper presented at the Society for Information Technology & Teacher Education International Conference, New Orleans, Louisiana, United States.
- Alseweed, M. A. (2013). Students' achievement and attitudes toward using traditional learning, blended learning, and virtual classes learning in teaching and learning at the university level. *Studies in Literature and Language*, 6(1), 65-73.
- An, H., Shin, S., & Lim, K. (2009). The effects of different instructor facilitation approaches on students' interactions during asynchronous online discussions. *Computers & Education*, 53(3), 749-760.
- Andresen, M. A. (2009). Asynchronous discussion forums: Success factors, outcomes, assessments, and limitations. *Educational Technology & Society*, 12(1), 249-257.
- Baker, D. L. (2011). Designing and orchestrating online discussions. *MERLOT Journal of Online Learning and Teaching*, 7(3), 401-4011.
- Birch, D., & Volkov, M. (2007). Assessment of online reflections: Engaging English second language (ESL) students. *Australasian Journal of Educational Technology*, 23(3), 291-306.
- Blackmon, S. J. (2012). Outcomes of chat and discussion board use in online learning: A research synthesis. *Journal of Educators Online*, 9(2). Retrieved September 8, 2015, from <http://www.thejeo.com/Archives/Volume9Number2/BlackmonPaper.pdf>
- Buckley, F. (2011). Online discussion forums. *European Political Science*, 10(3), 402-415.
- Bye, L., Smith, S., & Rallis, H. (2009). Reflection using an online discussion forum: Impact on student learning and satisfaction. *Social Work Education*, 28(8), 841-855.
- Canal, L., Ghislandi, P., & Micciolo, R. (2015). Pattern of accesses over time in an online asynchronous forum and academic achievements. *British Journal of Educational Technology*, 46(3), 619-628.
- Carceller, C., Dawson, S., & Lockyer, L. (2013). Improving academic outcomes: Does participating in online discussion forums payoff. *International Journal of Technology Enhanced Learning*, 5(2), 117-132.
- Carceller, C., Dawson, S., & Lockyer, L. (2015). Social capital from online discussion forums: Differences between online and blended modes of delivery. *Australasian Journal of Educational Technology*, 31(2), 150-163.
- Chang, C.-K., Chen, G.-D., & Hsu, C.-K. (2011). Providing adequate interactions in online discussion forums using few teaching assistants. *The Turkish Online Journal of Educational Technology*, 10(3), 193-202.
- Cheung, W. S., Hew, K. F., & Ling Ng, C. S. (2008). Toward an understanding of why students contribute in asynchronous online discussions. *Journal of Educational Computing Research*, 38(1), 29-50.
- Colbran, S., & Al-Ghreimil, N. (2013). The role of information technology in supporting quality teaching and learning. In L. Smith & A. Abouammoh (Eds.), *Higher education in Saudi Arabia: Achievements, challenges and opportunities* (pp. 73-82). Dordrecht, Netherlands, Europe: Springer.
- Creswell, J. W. (2012). *Educational research planning, conducting and evaluating quantitative and qualitative research* (4th ed.). Boston: Pearson.
- Edelstein, S., & Edwards, J. (2002). If you build it, they will come: Building learning communities through threaded discussions. *Online Journal of Distance Learning Administration*, V(I). Retrieved September 8, 2015, from <http://www.westga.edu/~distance/ojdl/spring51/edelstein51.html>
- Field, A. P. (2009). *Discovering statistics using SPSS* (3rd ed.). London: Sage.
- Hamdan, A. (2014a, October). *Faculty members' perceptions of online learning in Saudi Arabia: The case for more professional development support*. Paper presented at the European Conference on e-Learning, Copenhagen, Denmark.
- Hamdan, A. (2014b). The reciprocal and correlative relationship between learning culture and online education: A case from Saudi Arabia. *International Review of Research in Open & Distance Learning*, 15(1), 309-336.
- Hartnett, M. (2012). Relationships between online motivation, participation, and achievement: More complex than you might think. *Journal of Open, Flexible, and Distance Learning*, 16(1), 28-41.

- He, P. (2012, April). *Evaluating students online discussion performance by using social network analysis*. Paper presented at the 9th International Conference on Information Technology- New Generations, Las Vegas, Nevada, United States.
- Hew, K. F., & Cheung, W. S. (2010). Possible factors influencing Asian students' degree of participation in peer-facilitated online discussion forums: A case study. *Asia Pacific Journal of Education*, 30(1), 85-104.
- Holmes, M., Tracy, E., Painter, L., Oestreich, T., & Park, H. (2015). Moving from flipcharts to the flipped classroom: Using technology driven teaching methods to promote active learning in foundation and advanced masters social work courses. *Clinical Social Work Journal*, 43(2), 215-224.
- Ismail, A. O., Mahmood, A. K., & Babiker, A. E. (2013). Computer labs: Training undergraduate students on an online lab by using asynchronous discussion forum as an online learning tool. *International Journal of Scientific and Engineering Research*, 4(11), 1109-1114.
- Jacob, S. M. (2012). Mathematical achievement and critical thinking skills in asynchronous discussion forums. *Procedia - Social and Behavioral Sciences*, 31, 800-804.
- Johnson, B., & Christensen, L. (2014). *Educational research: Quantitative, qualitative, and mixed approaches* (5th ed.). Thousand Oaks, CA: Sage.
- Jordan, K. (2011). Do beginning teachers know how to participate and interact in online discussion? Outcomes from a Victorian case study. *Australasian Journal of Educational Technology*, 27(7), 1247-1262.
- Kleinman, S. (2005). Strategies for encouraging active learning, interaction, and academic integrity in online courses. *Communication Teacher*, 19(1), 13-18.
- Knowlton, D. S. (2005). A taxonomy of learning through asynchronous discussion. *Journal of Interactive Learning Research*, 16(2), 155-177.
- Koole, S., Vervaeke, S., Cosyn, J., & De Bruyn, H. (2014). Exploring the relation between online case-based discussions and learning outcomes in dental education. *Journal of Dental Education*, 78(11), 1552-1557.
- Lee, L. (2009). Scaffolding collaborative exchanges between expert and novice language teachers in threaded discussions. *Foreign Language Annals*, 42(2), 212-228.
- Linjawi, A. I., Walmsley, A. D., & Hill, K. B. (2012). Online discussion boards in dental education: Potential and challenges. *European Journal of Dental Education*, 16(1), 3-9.
- Lloyd, M. (2011). A tale of six fish: Achieving social presence through discussion forums in an offline learning environment. *Journal of Learning Design*, 4(2), 39-51.
- Mayan, O., Sheard, J., & Carbone, A. (2014, January). *Understanding Saudi Arabian students' engagement in e-learning 2.0 in Australian higher education*. Paper presented at the 37th Australasian Computer Science Conference, Auckland, New Zealand.
- McNamara, J., & Burton, K. (2009). Assessment of online discussion forums for law students. *Journal of University Teaching & Learning Practice*, 6(2), 1-14.
- Nandi, D., Hamilton, M., & Harland, J. (2012). Evaluating the quality of interaction in asynchronous discussion forums in fully online courses. *Distance Education*, 33(1), 5-30.
- Naranjo, M., Onrubia, J., & Segué, M. T. (2012). Participation and cognitive quality profiles in an online discussion forum. *British Journal of Educational Technology*, 43(2), 282-294.
- Palmer, S., & Holt, D. (2010). Online discussion in engineering education: Student responses and learning outcomes. In L. Shedletsky & J. E. Aitken (Eds.), *Cases on online discussion and interaction: Experiences and outcomes* (pp. 105-122). Hershey, PA: IGI Global.
- Palmer, S., Holt, D., & Bray, S. (2008). Does the discussion help? The impact of a formally assessed online discussion on final student results. *British Journal of Educational Technology*, 39(5), 847-858.
- Pena-Shaff, J., Altman, W., & Stephenson, H. (2005). Asynchronous online discussions as a tool for learning: Students' attitudes, expectations, and perceptions. *Journal of Interactive Learning Research*, 16(4), 409-430.
- Riad, N. A., Saadat, M. F. M., & Badawy, A. I. (2013). Effect of blended learning approach on student nurses' attitudes and academic achievement. *Journal of Education and Practice*, 4(24), 152-159.
- Salter, N. P., & Conneely, M. R. (2015). Structured and unstructured discussion forums as tools for student engagement. *Computers in Human Behavior*, 46, 18-25.
- Sebastianelli, R., Swift, C., & Tamimi, N. (2015). Factors affecting perceived learning, satisfaction, and quality in the online MBA: A structural equation modeling approach. *Journal of Education for Business*, 90(6), 296-305.
- Shana, Z. (2009). Learning with technology: Using discussion forums to augment a traditional-style class. *Journal of Educational Technology & Society*, 12(3), 214-228.
- Song, L., & McNary, S. W. (2011). Understanding students' online interaction: Analysis of discussion board postings. *Journal of Interactive Online Learning*, 10(1), 1-14.
- Swan, K. (2001). Virtual interactivity: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance Education*, 22(2), 306-331.

- Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Warren, C. M. J. (2008, February). *The use of online asynchronous discussion forums in the development of deep learning among postgraduate real estate students*. Paper presented at the CIB International Conference on Building Education and Research, Kandalama, Sri Lanka.
- Wei, H.-C., Peng, H., & Chou, C. (2015). Can more interactivity improve learning achievement in an online course? Effects of college students' perception and actual use of a course-management system on their learning achievement. *Computers & Education*, 83, 10-21.
- Wilkinson, S., & Barlow, A. (2010, September). Turning up critical thinking in discussion boards. *eLearning Papers*,(21), 1-12.
- Xia, J., Fielder, J., & Siragusa, L. (2013). Achieving better peer interaction in online discussion forums: A reflective practitioner case study. *Issues in Educational Research*, 23(1), 97-113.
- Zhu, E. (2006). Interaction and cognitive engagement: An analysis of four asynchronous online discussions. *Instructional Science*, 34(6), 451-480.