Students' self-regulation, critical thinking, and learning performance in learning e-commerce through facebook

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ARTICLE INFO

ABSTRACT

This study aims to analyse the effect of Facebook as a social learning environment in relation to students' self-regulation (SR), critical thinking (CT) and learning performance in an e-Commerce course. A total of 295 undergraduate students taking the course were selected using cluster random sampling to identify their SR and CT. 50 out of 295 students were then selected purposively and were involved in the intervention process of e-Commerce course learning using Facebook. The post-test result indicated that SR, CT and learning performance in e-Commerce learning had improved after they went through the intervention process. Meanwhile, a positive correlation could be seen between CT and learning performance only, when analysed using Pearson correlation. Furthermore, a cross-tabulation analysis revealed a positive relationship pattern between the students' SR, CT and learning performance. Hence, this suggests that academic performance can be improved through SR and CT.

1. Introduction

The proliferation of social media platforms leads educators to use them as one of their teaching and learning tools to meet the demands of 21st century higher education. For instance, a number of researchers [1]–[3] have explored the potential probably the most favourable social media platform, which is Facebook, and have offered the opportunity to understand students' behaviours and interactions through this medium. In relation to self-regulation (SR), education through Facebook requires a person to be self-regulated to satisfy a variety of needs and motives [4]. The research has also found that students who self-regulate their learning are more academically successful since they use strategies to accomplish their goals because they believe that change and success are possible [5]. Although the concept of SR learning has been around for years, its application to online learning environments has not been widely researched. It is important to research this to uncover how students deal with information delivered over the Internet and how it contributes to their learning process. Moreover, for success in 21st century higher education, students require skills such as critical thinking (CT) ability. CT has been discussed extensively in education over the decades. Students who have high CT ability are more successful academically and have higher metacognitive abilities [6]. Previous research has also shown that students' CT abilities are significantly higher when these skills are taught through an online environment [7]. Therefore, this study examines Facebook's impact based on the social learning environment in relation to students' SR, CT and learning performance in learning e-Commerce. Based on the abovementioned background, a few questions have arisen for investigation, namely, what the effect is of the social learning environment using Facebook in relation to students' SR and CT in learning e-Commerce and what the relationship between students' SR and CT skills and performance when using Facebook.

E-Commerce is a core subject and should be taught through hands-on experiences in order to learn it effectively [8]. It is one of the few subjects that cannot be taught without implementing active learning as the major and, possibly, the only way of learning [9]. To this end, an online learning environment is appropriate to be utilized to engage students' active learning, as learning through an online medium requires a person to be self-regulated since he/she is re sponsible for organizing and reflecting on his/her learning [10], [11] discovered that students in online environments trained with SR ability were more responsible with their learning. However, there has been relatively little empirical research into SR usage in social learning environments, as most studies into SR skills focus on the skills in conventional teaching and learning. Moreover, as suggested by Yeh [12], lack of self-regulatory skills, such as effort regulation, can lead to difficulties, particularly in the online environment, in which students are expected to manage their own learning. Therefore, there is a necessity to measure students' online SR skills to ensure that they can survive in an online learning environment. In this research, the Online Self-Regulated Learning Questionnaire (OSLQ) designed by Lan et.al [13] is used as it is suitable for online environments and consists of six sub-scales construct, including environment structuring, goal setting, time management, help seeking, task strategies and self-evaluation.

Researches have also shown that, in an active learning classroom, students must generally adopt a CT, analysis and evaluation [14]–[17]. CT is an important topic in modern education and, mostly, educators are interested in teaching CT to their students. However, studies CT (e.g. [18], [19]) have revealed that CT is lacking in students. Often, students' complete assignments, do well in tests and get good grades but do not learn to think critically [20], [21]. This could be due to the way in which they have been brought up and the educational system, whereby CT skills have not been established [22]. Thus, a learning design which is in line with technology characteristics is required for students to be able to portray their ability when using it. As Casey [9], demonstrated that the use of web-based teaching and learning in e-Commerce is an effective technology in today's education, therefore, the potential of using social networking tools in studying the e-Commerce topic should be explored further, where social learning is the core learning environment that requires a proper learning structure, such as an SR process.

As indicated in the literature, social networking sites, mainly Facebook, have been one of the favourite research topics for researchers. However, there has been a lack of studies into the use of SR and CT using Facebook to improve undergraduate students' performance in e-Commerce. This lack of research might be due to the lack of agreement as to whether students should be taught to self-regulate their learning and CT without being taught in the course or whether they should be taught as an integral component of the subject. Moreover, studies conducted using Facebook are mostly researched from a social aspect without taking into consideration the usefulness of integrating teaching and learning as part of learning when socialising. Although Facebook can be used as a tool for teaching and learning, this might not guarantee performance success unless students' SR and CT ability skill levels are high, as SR and CT might be essential skills in predicting learning performance. However, there has been lack of information about these skills in research looking at this element and, therefore, there is a need to conduct research to determine the relationship. Enhancing CT skills and SRL in online learning also requires educators to implement the appropriate learning theory related to social learning environments, and social constructivist theory seems to be appropriate learning theory to be used as it emphasises how meanings and understandings grow out of social encounters [23].

A social constructivist learning environment is a place where an individual can work and learn with others and can share knowledge and experience and learn from one another to improve themselves. Findings by Gooch et.al [24] and Shaw et.al [25] have shown that social constructivism is the most effective pedagogical approach, building on social interaction and engagement. However, focus must be placed on those two aspects in learning to achieve a functional social learning environment. In summary, the lack of self-regulated and CT skills in an online learning environment needs to be overcome for students to perform well in their studies. SR is important because a major function of education is the development of lifelong learning skills, of which CT is one. Hence, the integration of SR processes through Facebook to enhance CT skills should be more systematically explored through proper research and the findings will be used as guidance for educators in the future who would like to use Facebook as a tool in their teaching and learning activities. In this study, the California Critical Thinking Skills Test (CCTST) developed by Facione [26] was used to measure students' CT. CCTST provides objective measures of participants' skills in six sub-scales (analysis, inference, explanations, interpretation, self-regulation and evaluation) and an overall score for CT.

2. Method

This research used a quantitative method through a single group experimental research design, which provided a treatment during the experiment process. While there was no control group for this experiment, the experimental group's effects were measured. This design involves a single group that is applied to the same specific group experiment. The learning process implementation using Facebook was conducted between week 2 and week 14. Post-test assessments were distributed in week 14 for SR, CT and performance tests. This research involved the following phases: (1) Preparing the Research Instruments; (2) Identifying the Self-Regulated Learning and Critical Thinking Level; (3) Conducting the Experimental Research.

2.1. Samples

In total, 295 university students were selected using a cluster random sampling method. Most of the respondents were female, with 160 students (54.2%), while there were 135 male students (45.8%). Next, in order to analyse the impact of Facebook on students' performances, SR and CT in learning e-Commerce based on social learning environments, two sections of e-Commerce classes (50 students) were purposively selected.

2.2. Instrumentations

The results were obtained using three research instruments, which were the Online Self-Regulated Learning Questionnaire (OSLQ), the Critical Thinking Questionnaire and the e-Commerce Performance Test.

2.3. Online Self-Regulated Learning Questionnaire

The OSLQ is a 24-item scale with a 5-point Likert-type response format having values ranging from strongly agree (5) to strongly disagree (1). The OSLQ has been adopted from Barnard-Brak et al. (2010) and consists of six sub-scale constructs, including environment structuring, goal setting, time management, help seeking, task strategies and self-evaluation.

2.4. Critical Thinking Test

The CT instrument testing level was a questionnaire constructed by the researcher based on e-Commerce and was an adaptation of the CCTST by Facione [26]. The CT questionnaire was comprised of six main elements of skill, including analysis, inference, explanation, interpretation, self-regulation and evaluation and 22 multiple-choice questions, 10 of which were open-ended questions. The total score for the questionnaire is 22 marks.

2.5. Learning Performance Test

An e-Commerce performance test was used to assess the students' learning performance. Students were given the pre-test and post-test to identify their learning improvement through the scores. Questions based on Bloom's Taxonomy were used as a reference to set the question paper and standard marking schemes were used as a guide to mark the papers. The test consisted of 20 items for objective questions, 8 items for subjective questions and 4 items for essay type questions. A pilot study was conducted to check the research instruments' feasibility and reliability using the index Cronbach Alpha and test-retest with 30 respondents from the total population. The Cronbach value for OSLQ was 0.809 and 0.850 for the CT test. The Cronbach Alpha indicated that the coefficient obtained was within the desired range [27]. This shows the evidence relating to the reliability and validity of both instruments. As for the performance test, the test-retest reliability was conducted and the Pearson correlation coefficient was 0.930, which was considered high. The questionnaires and performance tests were validated by three experts for content validity relevance to the e-Commerce subject.

3. Results and Discussion

3.1. Students' Self-Regulated Levels

Table 1 shows the students' overall SR levels. In total, 197 (66.80%) of the students' SR levels were average. Only 64 (21.70%) students were above average and none of the students' SR levels were high.

Table 1. Students' Self-Regulations Levels

Level of Self-Regulation	Number of Students	Percentage
Low (1-30)	2	0.7
Below Average (31-50)	32	10.8

Level of Self-Regulation	Number of Students	Percentage
Average (51-70)	197	66.8
Above Average (71-90)	64	21.7
High (91-120)	0	0
Total	295	100

3.2. Students' Critical Thinking Levels

Table 2 shows that 135 (45.76%) of the students had below average CT. Only 13 (4.41%) students were above average and none of the students' CT levels were high. Therefore, there is a necessity to increase CT levels among students.

Table 2. Students' Critical Thinking Levels

Level of Critical Thinking	Number of Students	Percentage
Low (1-5)	63	21.36
Below Average (6-9)	135	45.76
Average (10-13)	84	28.47
Above Average (14-17)	13	4.41
High (18-22)	0	0
Total	295	100

3.3. Students' Learning Performance

Table 3 illustrates the students' grades for scores obtained in learning performance before and after they experienced learning e-Commerce using Facebook. The students' learning performances improved after learning using Facebook. The majority (14) of the students obtained grade E, which showed a decrease compared to the pre-test performance, where 49 students obtained grade E.

Table 3. Students' Grade for Pretest and Posttest

Grade	Number of Students (Pretest)	Number of Students (Posttest)
A (75-100)	0	10
B (60-74)	0	10
C (47-59)	0	13
D (40-46)	1	3
E (0-39)	49	14
Total	295	100

The overall mean for the marks of 50 students for the pre-test was 17.32 and posttest was 54.32 (see Table 4). This finding indicates that there was an improvement in the students' learning performance from the difference between the marks, which was 37 marks before and after using the Facebook learning activity for 14 weeks. The post test score for the significant value of the Shapiro-Wilk normality test was 0.13. This result indicated that the value was more than the chosen alpha value of 0.05 and this finding concluded that the post test data was normally distributed.

Table 4. Normality Test of Pretest and Posttest

Type	Min %	Max %	Mean Percentage	SD	Kolmogorov-Smirnov Statistics	Sig.	Shapiro-Wilk Statistics	Sig.
Pretest	4	44	17.32	7.43	0.11	0.18	0.94	0.02
Posttest	22	96	54.32	18.80	0.10	0.20*	0.96	0.13
Difference	18	52	37	11.37	0.09	0.20*	0.98	0.37

From the results of the paired-sample t-test analysis, the significant (p-value) is .000 ($p<0.05$) (see Table 5). The mean of the students' pre-test and post-test scores revealed that there was a statistically significant difference. As a conclusion for the result of the treatment, the Facebook learning activities, with guidance from the instructor, did benefit the students in learning e-Commerce.

Table 5. Paired Samples t-test

	Paired Differences					t	df	Sig (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pretest-Posttest	37	15.83	2.24	32.50	41.50	16.53	49	0.00

3.4. Relationship between Students' Self-Regulation, Critical Thinking and Learning Performance

In this research, the correlation between SR, CT and learning performance has been analysed using Pearson correlation. The results in Table 6 show that student SR has no significant correlation with students' CT (r =-.08, p > 0.01). Furthermore, there is no correlation between SR and students' learning performance (r=-.20, p > 0.01). However, for CT with students' learning performance, there is a very weak positive correlation (r = .24, p < 0.01).

Table 6. Pearson Correlation between Students SR, CT and Academic Performance

	SR	CT	Academic Performance
SR	1	-0.08	-0.20
CT		1	0.24**
Learning Performance			1

a. ** Correlation is significant at the 0.01 level (2-tailed)

Although when using Pearson correlation, there was no significant difference, a crosstabulation analysis was conducted to identify any possible relationship between the variables (see Table 7). The results indicated that the majority of the students are average and above average for CT and SR. When the CT was at average, and above average levels, majority of the SRL also falls into above average and high levels. The results also showed that the help seeking element (n = 373), followed by the self-evaluation element (n = 365), had the highest posting frequency for SRL according to the content analysis of the Facebook interaction.

Table 7. Crosstabulation for SR, CT and Academic Performance

		SR		Total
		4.00	**5.00**	**1**
CT Level	1.00	0	1	7
	2.00	6	1	21
	3.00	15	6	19
	4.00	15	4	2
	5.00	2	0	50
Total	-	38	12	
Grade	A	7	2	9
	B	8	2	10
	C	10	3	13
	D	4	0	4
	E	9	5	14
Total	-	38	12	50

		CT Level					
		1	**2**	**3**	**4**	**5**	
Grade	A	1	0	2	6	0	9
	B	0	3	6	4	0	10
	C	0	1	6	5	1	13
	D	0	1	3	0	0	4
	E	0	5	4	4	1	14
Total	-	1	7	21	19	2	50

The SR level was average (66.80%) for most of the students. Nearly 78% of the students were at low and average SR levels. This environment focused solely on examinations, thus it lacked in improving students' SR levels. The findings seemed consistent with those by Wan [28] and showed that the learning environment played a big role in determining the SR levels; for example, Facebook gives students a variety of choices in learning that might not be possible in conventional instruction methods. In this research, Facebook learning activities were developed to improve learning performance by cultivating SR skills. The studies by Leveritt [29] indicated that students benefited from Facebook learning through their increased interaction and participation in discussions, as well as through the notifications of course related information. Besides SR, the researcher also examined student CT levels. Furthermore, considerable numbers of researchers had studied the CT process and how this concept might fit into the main SR framework [30]–[32]. The students CT levels were below average (45.76%). It was predicted that students were not exposed to CT skills, which was congruent with [33], who found that many students were not developing CT aptitude in their early undergraduate years. However, Reid indicated that CT can be taught [34], learned and transferred from classrooms

into other CCTST domains. As the SR level overview was average and CT was below average among university students, therefore, there is a necessity to enhance both skills. This finding agrees with that of Yates [35], who stated that the importance of CT is that it helps to influence students' self-regulatory processes but, at the same time, its growth might be fostered by various self-regulatory strategies.

The significant improvement in the marks in the posttest showed that, when learning using Facebook activities, students improved in their learning performance. This improvement might be due to the benefits obtained from the guidelines developed for the learning activities in Facebook prepared by the researcher prior to the activity discussion. The online learning environment's nature allows the students to interact without time constraints. For instance, the students were asked questions that required them to focus on the SR elements, CT skills and taxonomy levels Bloom. After that, the researcher taught the students to elaborate their answers by posting them in the Facebook page discussions. This activity's results showed that students have ability to communicate, display and share information with their classmates in the Facebook discussion page and, finally, to complete all the tasks involved. Similar findings were found in Hevedanl study [36], which revealed that a course supported by Facebook provided students with a number of benefits, such as increasing sharing and cooperation, strengthening student-student and student-faculty member communication, visualizing the content, drawing attention and increasing the students' interest in the course. There were findings in a similar vein in Kitsantas [37] study which revealed that social networking tools that are currently popular among college students can support student motivation and, at the same time, promote learning needs. Similar work conducted by Salehi-Sangari [38] indicated that students who self-regulate and possess performance goal orientation characteristics have significant positive effects on students' achievements. When students socialise with other students in Facebook they were learning at the same time, which shows that, through socialising, learning occurs [39] agreed that it has potential in enhancing classroom education.

The findings showed a significant difference between pre-test and post-test using Facebook in learning e-Commerce. All the items in SR increased, with the time management item as the highest score. This indicated that students have learned how to manage their time when learning online. This has been shown in several studies whereby online technology enhances academic performance [40]–[44]. CT skills were also analysed to determine the effect of Facebook learning activity. Based on the findings, among the six elements for CT, interpretation had the highest mean difference. The majority of the students obtained an average CT level after the intervention of using Facebook. This result was consistent with other researchers [45], [46], who reported higher levels of CT, along with higher course grade percentages for the students who used more online discussions in learning. The results of the correlation analysis demonstrated no correlation between SR and CT, while the correlation between SR and learning performance was not significant. As for the relationship between CT and students' learning performance, the results of the correlation analyses demonstrated no significant correlation. This result revealed that SR and CT were not significant predictors for learning performance. This finding was in contrast with that of Timare [47], in which it was revealed that there were significant positive correlations between SR strategies and the participants' Grade Point Average (GPA) scores. However, Timare showed no correlation between CT disposition and learning achievement for medical students [47].

Nevertheless, further analysis was conducted by eliminating students who failed in the learning performance test. A crosstabulation analysis was conducted to determine the relationships. Firstly, the relationship between CT and SR was identified. For this analysis, only students with above average levels and high self-regulated data were used, against students with CT of all levels. Based on the findings, there was a pattern and relationship in which, when CT was above average, the SR also was above average and high level. This indicated that CT and SR were correlated if those conditions were met. Nevertheless, years of studies have revealed that SR and CT were correlated [31], [32]. The relationship between the students' grades compared with SR levels also showed that most students who obtained grade C scored above average for SR levels. These findings were similar to those by Zimmerman (2008). Another result from the analysis indicated that the SR level increased after learning using Facebook. Much of the research is in line with this finding [48].

4. Conclusion

The research and the literature have shown that SR and CT skills are important, especially in higher education institutions. Moreover, creating optimal conditions in learning environments for SR is

crucial to help students develop as independent learners. In this research, Facebook learning activities has affected positively students' SR and CT levels. The research findings indicated that the students' academic performance, SR and CT levels were increased when Facebook was used in learning e-Commerce. The study's value was to provide students with an environment that encouraged the use and development of CT skills. Reading, analysing and replying to Facebook posts are good exercises to enhance CT skills. Bowers-Campbell suggested that using Facebook's features offers potential for battling students' poor SR behaviour and low self-efficacy [49]. Facebook has provided a platform for educators to interact with students at any time, on any day throughout the semester. The online environment's accessibility enables student progress to be monitored continuously; in addition to that the interaction quality and quantity might be increased through Facebook. Introducing Facebook in learning e-Commerce might require a new paradigm to provide both virtual and traditional learning systems to meet the demands of the trends of 21st century technology. This approach will ensure that both students and educators can enrich learning more effectively. A limitation of this study is that the use of Facebook in the study only focuses on one subject, which is e-Commerce, and is limited by its small student numbers. Further research needs to be conducted for other subjects and other students, since the learning activity approach in Facebook might not have the same effect on learning in other subjects.

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