Peer Learning in the Class or on Facebook?
A Correlational Experiment on Learning Outcomes
Full Papers

Tala Talaei Khoei
Southern New Hampshire University
tala.talaeikhoei@snhu.edu

Amir Talaei-Khoei
University of Technology, Sydney
amir.talaei@uts.edu.au

Abstract

This paper presents two interventions to improve the peer learning practice in an Information System course; namely (1) class-based peer tutoring in small groups and (2) discussions on Facebook group of the course. The article aims at comparing the correlations between the learning outcomes with class-based peer tutoring as well as with Facebook engagement. The findings show that although the learning outcomes are correlated with the both of these two interventions, the students' engagement on Facebook has a stronger correlation with the learning outcomes. The study also reports the lessons learned in improving students' engagement on the Facebook group of the course. The results have been discussed in the lens of Theory of Peer Learning and the future avenues of research have been suggested. This study also motivates teaching practitioners in Information Systems to improve peer learning practices by the use of social networking sites in their courses.

Introduction

Topping (2005) defines peer learning as a knowledge acquisition or skill development activity through a support and help from peer learners or in other words equal status companions. In this definition, the essence of peer support has been centralized to the learning practice. However, Topping (2005) believes that peer support can occur through tutoring process or a goal-oriented collaborative task in a group. Peer tutoring looks at the interactions among students with the focus on the curriculum. Following the trend in this area, in the last decade collaborative learning as a common teaching practice has attracted great attention. Johnson et al (2014) states that collaborative learning is getting students to work on a goal-oriented task in groups to maximize their own and each other's learning. Although there has been a large body of literature on collaborative learning facilitated by social technologies (Tess, 2013), the role of social networking sites (SNS) in tutoring by peers has not been addressed adequately in the literature despite few recent attempts such as (Hong and Gardner, 2014).

The track history of SNSs for peer tutoring goes back to the use of online discussion boards that organize online community conversations along a thread of content or learning objectives (Greenlaw and Hepp, 1998). Although discussion boards are powerful tools to handle content-related interactions, they lack a comprehensive social engagement and non-pedagogical relationships among students that required for an effective peer tutoring environment (Hrastinski, 2008). Social engagement among learners can be boosted by social media sites such as Facebook (Abedin, 2011). There are two main reasons for that. First, Facebook has been proven as a successful platform in terms of user engagement (Heiberger and Harper, 2008). Second, students prefer Facebook for both socialize and facilitating peer learning. In a large-scale study (Kumpikaite et al., 2011), 91% of undergraduate students claimed that they hold and use a Facebook account. Among these, 54% of students utilize Facebook for their learning. Grosseck et al. (2011) state that students prefer Facebook over discussion boards in the learning management systems because of the rigid structure of the discussion boards and also social connections that Facebook provides.

While the peer tutoring has been shown in literature as an effective practice in learning (Ashwin, 2003; Kuh, 2009), the role of social networking sites in comparison with traditional peer tutoring practices in physical contexts by friends and classmates from the perspective of learning outcomes has not attracted adequate attention.

This paper looks at two main interventions that encourage students for peer tutoring; namely small group discussions in the class and discussions on the Facebook groups of the course. The study aims at comparing the potential correlations between the learning outcomes with class-based peer tutoring and Facebook engagement of students. The article reports an experiment in a second-year undergraduate course in Information Systems major, in which the students were asked to participate in both of the interventions. The impact in their learning outcomes was studied. In addition to that, this study reports the qualitative observations of the teaching team and the lessons learned during the deployment of Facebook in the course. This can be served as guidelines for future attempts of this intervention.

The rest of this paper is organized in the following way. The section for methods presents the way that the data was collected and analyzed. The readers can also find more details about the course. The section for results presents what has been found in the analysis. Finally the last section discusses the findings in and suggests future works. This section also presents the limitations of this study.

Methods

Design

Sample Group: The students in a second-year undergraduate course in Bachelor of Information Systems were invited to participate in the study. Only one student did not participate, which remained the experiment with 203 students (range 19 – 42 years; Mean = 21.4; SD = 2.1 ; 109 males).

Research Context: The topic of the course was enterprise resource planning (ERP); managerial perspective, but with some technical flavor such as introducing the technologies that can be used in ERPs. The course did not involve any hands on experience by students but focused more on managing an ERP system in an organization. For twelve weeks, the course had one and half hours of lectures and one and half hours of tutorial/workshop sessions weekly. The lectures were given by the course coordinator and the tutorials in classes of 24 students were managed by teacher assistants.

One of the graduate attribute targeted in the course was to develop analytical skills among the students in the context of ERP management. Since it is believed that peer touting is an efficient method in developing analytical skills through discussions among peer students (Blum-Kulka and Snow, 2004), the course were promoting peer learning with the following two strategies:

- *Group Discussions in Tutorial Classes*: In each tutorial class, the students were divided in six groups of four (if possible otherwise one more or less in the group) that have been formed by the free choice of students. Each week, in the tutorial classes, the students were given five discussion questions and they were asked to discuss the questions in the group. The students then were required to present their opinions in the class and get feedback from other students and the teacher.

- *Discussions among Students in Facebook Group*: The course had a Facebook group that was managed and moderated by the course coordinator and the students could join in a voluntary basis. However, only one student chose to not join the Facebook group of the course. The Facebook group was a closed group and the students were sent an email that invited them to join giving them a hyperlink. Each week, the course coordinator were posting five discussion questions online relevant to the topic of the week. These questions were different from those that have been discussed in the class but in a very similar theme and difficulty level. The students could provide their answer as a comment to the post. They were also encouraged to discuss the questions in the comments with their classmates. For example, they could agree or disagree with others or they could provide external link to support their idea. The course coordinator was not taking any action in regard to the questions till the next week when he was providing his feedback. The students were also encouraged to post their questions as well as any relevant interesting point that comes to their mind on the Facebook group and answers to other students' questions. Joining and engagement in the Facebook group of the course was not mandatory and did not involve any mark for the course.

Rationale for the Comparative Correlational Experiment: All research subjects participated in both of the above two activities in the course. This helped to collect the data to be able to compare the

both forms of peer tutoring ; namely (1) in the class in the form of discussion with other students in the group and (2) online on the Facebook group of the course in the form of commenting on other students' or the coordinator's posts.

Observations: In order to document the observations, the course coordinator and the teacher assistants were taking notes from any interesting point that they observed. The note taking was in a particular format that the observer had to follow. She/he must describe the event, say whether it was related to the class discussions or the Facebook, and say whether it involved only students or students and the teaching team. They were also asked to write their opinion about the event and they were encouraged to discuss it with students (if it was possible) to get more insights from their perspectives.

Analysis

The quantitative analysis phase in this experiment was involved the study of correlations among three different constructs; namely (1) students' engagement in the tutorial discussions, (2) students' engagement in the Facebook group discussions and (3) students' learning outcomes. For this to happen, we took the following three steps:

- *Step 1 - Measurement*: The following three measures were defined for each of the above-mentioned constructs and calculated for each participant:

    o Tutorial Engagement: Except the first and the last weeks of the semester and for the remaining ten weeks (week 2 - 11), the students each week were given 0.5 mark for their contribution and engagement in the group and 0.5 mark for their engagement in the class discussions (i.e. in total one mark weekly for ten weeks that gives the students the maximum of 10 marks for their participation). These marks were given by the teacher and based on the close observation.

    o Facebook Engagement: The students' engagement on the Facebook group of the course was calculated by dividing their number of the posts (week 2-11) by 10 (the number of the weeks). This was measured for each student.

    o Learning Outcome: The students' learning outcome was calculated by their final mark in the course excluding the 10 marks of Tutorial Engagement. This included 50 marks for two report assignments and 40 marks for the final exam of 5 discussion questions. The 10 marks for Tutorial Engagement were excluded to avoid internal bias as it was already taken into account in the first measure.

- *Step 2 – Calculating the Correlation Efficient*: In this step, the correlation between the data sets of Tutorial Engagement with Learning Outcome and also Facebook Engagement and Learning Outcome was calculated. In order to do so, the Bivariate Correlation Analysis was conducted in SPSS to calculate correlation coefficients (r). The significant level of these correlations was measured by *p*-value. One may say that the correlations between the Tutorial Engagement and Facebook Engagement with Learning Outcome are because of the natural correlation between Tutorial Engagement and Facebook Engagement. For example, a possibility is that one may participate in Facebook just because he/she was very active in the group discussions and as such she/he became interested in the topic. Therefore we also test the correlation between these two constructs.

- *Step 3 – Comparing the two Correlations*: In order to compare the calculated correlations between the above mentioned constructs, the Meng et al (1992) method to compare the dependent correlations with a shared variable was employed. This method explains the significance of the difference between these two correlations.

Having done the above three steps, the null hypothesis explaining the significance of the difference between the correlation of the Tutorial Engagement with Learning Outcomes and Facebook Engagement with Learning Outcomes would be retained or rejected. The correlation in all above calculations was considered as 2-tailed.

In order to analyze the qualitative notes, the teaching team were meeting every week and discuss their notes. This allowed them to organize their observations in a weekly basis. At the end of the semester, the

observation findings were discussed and concluded in a workshop of 17 academics who were involved in teaching similar courses.

Results

Quantitative Results: Correlations between Tutorial versus Facebook Engagements with Learning Outcomes

The quantitative results in this study aim to demonstrate the statistical correlations between the engagement of students on tutorials and Facebook with learning outcomes. This would show whether there exists any correlation between students engaging on Facebook or tutorial sessions and having better final marks. The measures for quantifying the three constructs are explained in the Analysis section; i.e. (1) Tutorial Engagement, (2) Facebook Engagement, and (3) Learning Outcomes.

Results of Correlations: Following the guidelines of Evans (1996), the results indicated that the correlation between the students' tutorial engagement and their learning outcome was high but not significantly high ($r= 0.781$, $p <0.001$). However, it was found that the correlation between the students' engagement with Facebook group of the course and their learning outcomes was significantly high ($r = 0.844$, $p <0.001$).

Interpretation of Correlations: The above mentioned results indicate that the both interventions have positive 2-tier correlations with the learning outcome. This demonstrates that whether the students participated in the tutorial sessions or engaged with the Facebook group of the course they had better final marks. Although correlational studies do not prove the casual relationships, they illustrate the potentials of both peer tutoring interventions in the class on the Facebook group course in the learning outcomes for students.

Comparing the Correlations: The difference between the above mentioned correlations was highly significant, $z = 2.196$, $p <0.028$ and the correlation between the students' tutorial engagement and their Facebook Engagement was week ($r = 0.387$, $p <0.001$). Therefore the Null Hypothesis implying the no significant difference between these two correlations was rejected. It was revealed that the correlation between the students' Facebook engagements with their learning outcomes was significantly stronger than the correlation between their engagement in group discussions during the tutorial and their learning outcome in the course.

Interpretation of the Comparison: The comparison of the two statistical correlations revealed that the engagement in Facebook in comparison with the tutorial participation has a stronger correlation with the students' learning outcomes. This demonstrates that the engagement of students on the Facebook group of the course provides better potentials than participating in the tutorial activities for students to improve their learning. One may say this can be influenced by the correlation between the students' engagement on Facebook with their engagement in the class-based peer tutoring. However, this correlation has been found not significant.

Qualitative Observational Results: Lessons learned to improve students' engagement on Facebook

The qualitative findings have been extracted from several informal discussions between the course coordinator and the students as well as the direct observations of the teaching team. These findings were discussed first among the teaching team in the weekly meetings and then concluded in a workshop of 17 academics teaching similar courses.

Sense of community is a driver for the students' engagement on Facebook.

The use of social media in the class does not necessarily lead to the establishment of physical engagement among students, in fact it was only rare cases that it did. A sense of community to the group when students used Facebook was identified. The students could spend great deal of time paying attention to other members to make sure that they have understood the learning concepts. In some occasions, it was observed that the students also search online to seek extra materials and even put it up as a link to others in the Facebook group. This is consistent with the finding of Abedin et al. (2010).

Psychological engagement is higher on Facebook than physical engagement.

In terms of psychological engagement, it was found that Facebook could significantly improve the channel of communication among students. This might be due to the fact that these days students log in to their Facebook account quite often. In an American research, 36,950 students from 126 universities were studies. In this study, 90% used social networking websites and 97% used Facebook, in addition 94.2% engaged with to the social networking site on a daily basis (Dahlstrom et al., 2012). While students are required to visit the website and log in to see the announcements when using online learning systems, social networking sites use a notification system that can be set to be used on mobile phones. This way, most of students will at least see others' posts whilst they might choose to participate or not in the discussion. However it was found that Facebook was not effective in bringing students engagement at a physical level. In this experiment, we observed that students discuss the materials online but they do not tend to bring the discussions on the physical level in the class.

Managerial topics attract the students' engagement on Facebook more effectively.

In a comparison of semi-technical topics in the course with more managerial aspects of ERP, it was also observed that Facebook tends to be more effective in engaging students with the course materials in managerial topics than in technical subjects. This might be due to the fact that Facebook does not provide enough facilities and tools for technical communications e.g. symbols at the commencement of a post is not supported.

Student engagement occurs along the right amount of learning materials.

It was observed that long-term engagement can only occur where there are many members of the group interacting. This behaviour relates to the formation of a social reality perspective that can be found in cultivation theory (Romer et al., 2014). Cultivation theory in most basic form suggests that social media is responsible for shaping social reality. As such if there are not many interactions happening in the social context, social media cannot be effective in long term. Whilst this rationale is applicable for engaging students with the learning materials if the Facebook group is continuously populated with learning activities, the students find it difficult to find an opportunity to learn from their peers and they may more engaged with just answering and giving their opinion to the learning activity posted on the Facebook. It is strongly recommended that the learning materials on Facebook should be designed to facilitate the students' engagement with their peers. They should not be overwhelming.

Conclusion, Discussion and Future Work

In this paper, an experiment has been reported on 203 Information System students for a second year ERP course. The experiment involved peer tutoring activities in the small groups in tutorial/workshop classes. It also alternatively engages the students in Facebook for discussing on the topic of the week and learns from their peers.

The correlations between the students' engagement in the class-based peer tutoring and also their alternative engagement on Facebook group of the course with their learning outcome have been compared. The results indicates that although the both types of engagement with peer tutoring have shown significant correlations with the students' outcomes, the engagement on Facebook has demonstrated a stronger correlation with the learning outcomes. The present results are consistent with the earlier research on peer tutoring for enhancing vocational English learning (Lam and Avery, 2014). In Lam and Avery's paper, they main focus was on the effect of peer tutoring on learning outcomes, however they also found that some students organized an online video discussion groups to practice vocabulary pronunciation and oral presentation with their peers. They claim that these additional experiences gave students more opportunities to learn from their peers outside normal classrooms. We also found that there are potentials in extending the class-based peer tutoring practice to an online intervention such as Facebook.

Although the current study does not look at the casual relationships between these constructs and only investigated the correlations, it proposes the potentials for such learning practices on Facebook as a new delivery model for peer tutoring. This opens new avenues of research to collect empirical evidence in

casual relationships among these constructs as well as contextual factors such as technicality of the course.

In what follows, we discuss these potentials from theoretical perspective, which remains us the agenda for future research. Then, we point out some recommendations that have been extracted from the observations of the teaching team. Finally the limitations of this study will be discussed.

Theory of Peer Learning: Justifications and Avenues of Research for Quantitative Results

Topping (2001) define the peer learning constructs as the interaction of five constructs; namely organizational or structural features, cognitive conflicts, error management, communication and affective components. In this section, the applications of these constructs in peer learning on Facebook are going to be discussed.

One of the main organizational advantages of using Facebook group comparing to the class-based peer tutoring is the power of crowd and the social context that this setting creates. This concept is built on the notation that peer tutoring occurs through not only a learning exercise but also with a social context with variety of people. Although in a class-based context the students had social conversations, the authors' observations indicate that there have been non-task related comments on the Facebook that would not be possible in small group discussions. This potential is in stark contrast with the concept of individualization of learning in small groups introduced in the Topping's model of peer learning (Topping, 2001). Therefore further research in this area is required to investigate the actual individualization of learning that occurs during crowd communications over Facebook in comparison of downsizing it to a small group. Although the current study demonstrates the stronger correlation of learning outcomes with the engagement on the Facebook group of the course comparing to small groups in class peer tutoring, the Topping's claim on the contribution of small groups needs further doubtful investigations. This is also in support to the recent work (Hong and Gardner, 2014) marrying the theory of social learning (Parke, 2014) and peer learning (Topping, 2001).

Cognitively, peer learning requires challenging as well as supporting the learners' opinions. Facebook providing the immediacy and crowd in feedbacks can empower the peer tutoring. In many occasions, particularly in the posts that required substantial application oriented perspectives, there were more than 100 comments challenging someone's idea or supporting it. Not to say that most of these comments could be posted in less than a day. Many of these comments were back-and-forward answering comments among few students; while there have been also many students that also came up single inputs.

Error management is a monitoring mechanism that has been introduced in peer learning model of Topping (2001). In several informal conversations between the students and the teaching team, the students mentioned that they were very impressed with the fact that on Facebook people talk and discuss about some aspects of the course that they could not realize it themselves. Therefore, these points came to their attention without even asking them or thinking about them. This was very apparent when students were doing their assignments and they put their questions online. This model of error management offered by the Facebook group of the course is an innovative intervention to the monitoring mechanism explained by Topping (2001). While there is no monitoring occurs, the errors can be managed in an efficient way. The difference between the traditional class-based peer tutoring and the Facebook group is related to the concept of pull versus push explained in Computer Supported Cooperative Work (Randell et al., 2009). In fact, in class-based peer tutoring, the students had to pull their errors in discussions with other peers, while in the Facebook groups these errors would be demonstrated to them in a push manner even if they haven't asked for it. The concept of pull versus push and their contributions in Facebook-based peer tutoring can open research opportunities to provide empirical insights in the underlying issues and challenges.

One of the drawbacks for the class-based peer tutoring is the heavy demand on the students' communication skills, which is clearly an optimization. Beside the variety and the differences of communication skills among students, not to say that we also have international students that may require extended time in delivering their opinions. This would be very hard in the context of face-to-face peer tutoring when many student feel shy of talking in front of other members of the group. The Facebook group gives all students this opportunity to relax from the face-to-face pressures that they may feel in

communicating with their peers. However, this needs further investigation by empirical results from the students' perspective.

From affective components there are few considerations that are required to be taken into consideration. For example in practicing peer tutoring on Facebook comparing to the class, Lockyer and Patterson (2008) believe that learning in such informal settings as Facebook is not considered a highly conscious activity unlike in the classrooms and would be surprisingly more effective. The sense of community has also been shown as a very effective element in improving learning outcomes in social networking sites such as Facebook (Abedin et al., 2010). Although Abedin et al (2010) indicate the impact of course characteristics, they do not compare class-based and Facebook-based peer tutoring in this regard. This needs further research.

Recommendations from Qualitative Results

The study found that contextual factors such as managerial flavor of the topic as opposed to technical topics play a significant role in student engagement with Facebook. It was found that the Facebook groups are effective interventions in peer tutoring. This results are in the stark contrast with Junco et al (2011) who have found using Facebook and Twitter can have positive or negative impact on learning outcomes depending on the learning context. However,   this difference might be due to the fact that contextual factors play a significant role in this setting and it appears that in our experiment we could set the right context. It is recommended that faculty and administrators develop educational practices that include using Facebook in ways that maximize engagement by extension to the overall learning experience. There is an opportunity to assist students using social networking sites. Given that Facebook is becoming more and more popular among students (Dahlstrom et al., 2012), it is important for universities and higher education institutes to be aware of potentials of possible interventions that are available in order to enhance students' academic experience.

It also appears that conventional online learning environments such as Blackboard and Moodle have definite limitations when compared to Facebook. The push mechanisms of Facebook that indicate a new discussion point to students on their smart phone means that the University course they are undertaking can be more actively at the forefront of their daily life. This constant reminder of discussion points can help students become more involved with their studies. The down side of this is the 24/7 engagement with technology that is occurring not only for students but many people (in particular employees) at all levels of human endeavor.

Limitations

The present work examined the relationship of the students' engagement in class-based and Facebook-based peer tutoring with their learning outcomes. The statistical procedure – correlation - used in this work does not evaluate possible casual relationships between these constructs. Therefore, due to the different objective of this work, it cannot be concluded that deploying the Facebook groups are more effective peer tutoring practice comparing to class-based discussions in small groups. However, it opens an opportunity for future studies to investigate the causalities among these constructs.

In addition, it can be argued that learning is a complicated procedure that requires more accurate metrics than the final mark for students. While authors agree with this drawback, it should be noted that the objective of the work is to provide a proof of concept on potentials that can be reached by using Facebook groups as a peer tutoring practice. It is encouraged that researchers in this area conduct further research and in particular qualitative interviews that can demonstrate the underlying impact of this intervention.

The major limitation of observations in this study is the social complexity involved in the experiments. This makes it almost impossible to conduct complete cross analysis.

A further limitation related to this study is that the experiments did not allow finely tuned analysis of individual differences in the outcomes of the study. For example, there is an extensive body of literature on the impact of gender on the effectiveness of social networking sites. Given the importance of individual differences on outcomes, further research should examine the relationship between antecedents such as gender, parental education level, etc. on student engagement. This can serve as a future study.

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