Investigating the Effects of Problem-Based Learning in a Virtual Group on Collaborative Learning, Social Presence and Student Satisfaction in Surgery Department

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ABSTRACT

Background: Social media have become an indispensable part of human life and influenced the medical education and professions in recent years. The purpose of this study was to investigate the effect of Problem-Based Learning (PBL) in a virtual group on social-collaborative learning, social presence and satisfaction among the medical students in surgery rotation.

Methods: This was a quasi-experimental study with a one-shot posttest-only design that was performed on 66 trainees attending the surgical wards in teaching hospitals of Mashhad Islamic Azad University from February 2018 to July 2019. A virtual Telegram group was created for the learners to share interesting or rare educational cases at different hospitals, express their views on the issues, and engage in discussions until the next morning. Demographic and CLSS (Collaborative Learning, Social Presence and Satisfaction) questionnaires were used to collect data and to measure students' perceptions of collaborative learning, social presence and satisfaction. The data were analyzed using SPSS 20 software.

Results: The mean age of participants was 28.5±7.6 years. The average student participation rate in the group was 95.25%. The results showed that there was a significant correlation between the overall scores of the three questionnaires (social presence, satisfaction, collaborative learning) (P<0.001).

Conclusion: Given the high level of participation and satisfaction among students, using social networks as a complement to education is recommended.

Keywords: Virtual System, Social Networks, Collaborative Learning, Satisfaction, Problem Based Learning

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Introduction

Today, the influence of the Internet and social networks on human life has led to tangible changes in the forms of information distribution and communication, expansion of cultural boundaries, users' habits, and individuals' lifestyles in general (1-3). Educational activities are no exception, and the development of social media and networking facilities has paved the way for new approaches in education (5, 4).

Research shows that approximately 80% of young people are members of one of the social networks with a tendency towards academic learning. Social networking is an integral part of the lives of millennial students (6). Most students are free to share their opinions and concerns and receive suggestions and comments from their online friends. Therefore, by enabling learners to hold discussions, search for information, share resources and create a learning community on a device like mobile phone so social networking appears to be an adequate method in learning (7).

According to the theory of social constructivism, socializing and interacting with other people can help students shape their knowledge and learning process. Based on this theory, cognition and learning are context-dependent. In other words, thinking in the social and physical context, engaging multiple senses, developing multiple perspectives, top-down processing, social incentives, choice and interest are the facilitators of learning (8).

Grayson et al Presented a model for analyzing online learning communities with three components that are essential to the success of a learning community, including social presence, cognitive presence, and teaching presence. Training experience is evident in all three components.

Social presence is manifested in the individuals' ability to express themselves as a members of a community. Their performance in the group as well as their acceptance of others' presence is defined as having an impact on effective learning because learners feel that they are receiving sufficient support from those around them and therefore, it enables them to share their ideas in class (9). In problem-solving groups, prior to learning, social presence is essential for students to engage in topics with which they are not already familiar, since it enables them to comment on what they are unaware of. In addition, by studying the subject, team members share their findings and reach a consensus over the topic under discussion, and organize and reconstruct their knowledge of that topic. This process involves high-level cognitive processes such as debate, disagreement, and challenging others' ideas. Promoting social presence in these learning groups can promote face-to-face learning (10). Social media can be considered as a set of constructive tools that facilitate collaborative learning. Certainly, the objective in this kind of training is not to replace traditional learning but it can be regarded as a complementarity approach. However, teaching and learning and assessment methods in traditional education are needed to adapt to the age of communication and information (11). Social media have changed the role of the teacher from a content provider to a facilitator of learning. Learning environment is fluid and students are able to provide feedback and exchange information. The Lipman Exploration Society and the Wenger Activity Society have shown how members of the learning community ask and support each other and guide each other in building appropriate and effective knowledge. According to Wilson participants in an electronic setting share a common sense of belonging, trust and expectation for learning, and commitment to participate and share in this community (12). Balakrishnan has shown in his research that the use of social media in teaching and learning further expands the experience of participation and communication among school students and university students (13). Jabri-Al & Eid's research also shown that there were positive and meaningful relationships between online conversations, file sharing, knowledge sharing, and the pleasure of learning (14). The results of

the Bickerdike's study indicated that study habits and study strategies are associated with increased use of online social networks (15). The findings of a study by Kmsay revealed that learning and retention through virtual networks increases significantly as compared to in-person training (16). Robinson et al., created a PBL group in WhatsApp for the first-year students of radiography, and it was found that students display all the attributes associated with promotion of social presence (17). The students had direct and immediate access to the application, were notified of the new posts, received the messages with one click, and actively joined the conversations. Also, the ability to upload photos, videos and audio with a single click is another benefit of this type of social network. Since people have to be invited to the group, there is a stronger connection between the group members and group cohesion is higher than open public sites like Facebook (18). Barhoumi's study recommended the use of these social networks as a complementary learning method to in-person classes for the purpose of enhancing learning (19) Therefore, social networks appear to be ideal venues for learning since they enable learners to hold discussions, search for information, share resources and create a learning community on a device such as a mobile phone (20) Accordingly, a virtual problem-solving group was formed to provide uniform clinical education in different hospitals and to make the best use of students' time with their favorite tools. In fact, we took advantage of the potential of social media and students' interest in designing a supplementary education program in surgery, and in this context we aimed to examine learner satisfaction, collaborative learning, and social presence.

Methods

This was a quasi-experimental study with a one-shot posttest-only design, conducted at the surgical department of Islamic Azad University of Mashhad; all medical students in the surgery rotation were invited to participate in the study. Two-month surgical

courses were held and in each course, students including externs and interns were divided into three groups, and each group rotated through the surgical wards of the three affiliated teaching hospitals to undergo clinical training. A total of 66 externs and interns entered the study through census sampling. Inclusion Criteria were the students who enrolled in surgery rotations of Islamic Azad University of Mashhad, who received training from February 2018 to July 2019, and who were willing to participate in the study. Exclusion criteria included the students who were unwilling to continue their participation and those who did not fill in the questionnaires completely.

A virtual group called "Surgery PBL" was created in the Telegram application with the aim of establishing educational communication among the students of surgical wards at different hospitals within and outside the educational setting.

The reason for choosing this software was availability, free services and the ability to transfer multimedia messages. In the virtual group, students shared interesting or rare educational cases based on the staff's opinions, including the interpretations of paraclinical results, and patient histories they had observed. Each problem was fully addressed before a new one was put forward. All students could comment on the cases, make personal statements, hold debates, study the sources and evidence independently, request additional information, share views and conclusions of their studies, and gradually find ways to solve the problems, until the next morning.

The professors of the surgical group were also members of the group. They followed the discussed topics and provided guidance as facilitators when needed. Finally, the next morning before the clinical round started, problem solving was conducted and announced to the group in the classroom. This group activity encouraged the sharing of educational experiences in various fields. At the end of the course, a researcher evaluated the students' participation by means of a

checklist that determines if they added new cases, participated in discussions, inserted correct comments, cited credible sources and evidence, and engaged in interpersonal communications.

It should be noted that all students volunteered to join the group and there was no evidence of non-participation. During this course, all students had an Android mobile phone, and only two students used the web Telegram version. The collected data from the last 8 months were analyzed. By the end of each course, the students completed the CLSS questionnaire anonymously to provide the means for evaluating that course.

The questionnaire CLSS (Collaborative Learning, Social Presence and Student Satisfaction) consists of four sections and 38 questions that are used to measure the students' perceptions of collaborative learning, social presence and personal satisfaction. The first part of the questionnaire included demographic information including age, gender and the second part consisted of 11 questions about overall satisfaction with the course. The third part involved a collaborative learning assessment and included 8 questions measuring the students' preferences regarding individual or teamwork, online or in-person interaction and participation rates.

Finally, the fourth part of the questionnaire Included 17 questions used to measure the student perceptions of social presence based on social context, online communication, interactions, and security (21). This questionnaire was used in 2007 by Hyojeong so and Thomas A.Brush after applying factor analysis and corrections on the initial three parts of the questionnaire .Cronbach's alpha reported 0.85 for satisfaction, 0.72 for collaborative learning and 0.85 for social presence (22).

In order to use the CLSS questionnaire, the English version was first translated into Persian by a professional translator, and the translated version was returned to English by another person fluent in both languages. The face and content validity of the Persian version was confirmed by 5 faculty members in the fields of surgery and social medicine. The mean CVR and mean CVI were 99.72 and 0.95 respectively. To assess the reliability, the Persian version of the questionnaire was completed in a pilot group consisting of 20 students. The obtained Cronbach's alpha coefficient in three questionnaires on satisfaction, collaborative learning and social presence was 0.89, 0.87 and 0.76, respectively.

It should be noted that the participants in the pilot study were not included in the original study.

Questionnaire items were scored on a five-point Likert scale (strongly agree (4), agree (3), disagree (2), and strongly disagree (1). The data were analyzed through descriptive statistic and correlation coefficient by SPSS 20 software.

In terms of medical ethics, at the beginning of each course in a surgical ward, the aims of the study and activities of the virtual group were explained to the students. Students joined the Telegram group on their own free will, and participation in the project did not affect the evaluation of the students' performance in the course and they were free to leave the study group whenever they wanted.

Results

Data analysis showed that 66 students participated in the last 8 months of which 18 were male and 48 were female with the mean age of 28.5 ± 7.6. The average student participation rate in the group was 95.25%. During these eight months 1349.5 ± 177.6 posts were shared on average in each group. Interactive posts included asking questions, answering questions, agreeing, quotes, and making references to other posts. Stickers, disrespectful messages and irrelevant discussions were classified as affective posts. The mean number of interactive posts in each group was 869.25 ± 164.3 and the mean number of affective posts was 331 ± 17.26. In each group on average, 290.4 media include photos and videos were shared.

For each item of the questionnaire, the scores are reported as mean and standard deviation and then sorted in descending order

(Tables 1-3). As can be seen, the mean scores reported in Table 1-3 are close to the maximum score of 4 and are higher than half of the max score. As a result, students' perceptions of social presence, collaborative learning, and satisfaction with this approach have been high and close to the maximum score.

In order to investigate the correlation

Table 1: Mean and standard deviation of social presence scores in descending order

Item	Mean±SD
Messages are social forms of communication. (Question1)	3.91±0.83
Messages are impersonal. (Question 4)	3.76±088
It is unlikely that someone else will change your messages in the group (Question17)	3.67±0.98
Social media allow relationships to be established based upon sharing and exchanging information. (Question11)	3.63±0.92
Virtual group allows me to build more caring social relationships with others. (Question12)	3.58±1.05
Messages convey feeling and emotion. (Question2)	3.55±1.11
Using social media is a pleasant way to communicate with others. (Question5)	3.54±1.19
The language people use to express themselves in online communication is stimulating. (Question6)	3.34±1.11
Virtual group permits the building of trust in relationships. (Question15)	3.29±1.02
Social media are technically reliable (e.g., free of system or software errors that might compromise the reliability of your online messages reaching ONLY the target destination). (Question10)	3.28±1.26
The system is private/confidential. (Question3)	3.24±0.91
It is easy to express what I want to communicate through social media. (Question7)	3.23±1.15
It is unlikely that someone might obtain personal information about you from the virtual group messages. (Question13)	3.12±0.97
The language used to express oneself in online communication is easily understood. (Question 8)	3.05±1.10
I am comfortable participating, even though I am not familiar with the topics. (Question9)	2.88±1.20
Where I access virtual group (home, office, computer labs, public areas, etc.) does not affect my ability/desire to participate. (Question14)	2.76±1.07
The large amounts of virtual group messages (numbers of messages and length of messages) do not inhibit my ability to communicate. (Question16)	2.70±1.21

Table 2: Mean and standard deviation of Satisfaction scores in descending order

Item	Mean±SD
Using the Telegram was a useful learning experience (Question5)	3.60±1.07
The diversity of topics in this course prompted me to participate in the discussions. (Question6)	3.44±1.09
I was stimulated to do additional readings or research on topics discussed in the course. (Question2)	3.44±1.07
I was able to learn from online discussions. (Question1)	3.40±1.22
As a result of my experience with this course, I would like to take another distance course in the future. (Question4)	3.40±1.10
Discussions assisted me in understanding other points of view. (Question3)	3.34±1.10
I put in a great deal of effort to learn the social media communication systems in order to participate in this course. (Question7)	3.17±1.11
Overall, the instructor for this course met my learning expectations. (Question10)	2.93±1.05
Overall, this course met my learning expectations. (Question11)	2.83±1.07
Overall, the learning activities and assignments of this course met my learning expectations. (Question9)	2.82±1.10
My level of learning that took place in this course was of the highest quality. (Question8)	2.69±1.04

Table 3: Mean and standard deviation of Collaborative Learning scores in descending order

Item	Mean±SD
I was able to learn new skills and knowledge from other members in my group. (Question4)	3.79±0.97
Collaborative learning in my group was time consuming. (Question7)	3.68±1.19
I felt like being a part of a learning community in my group. (Question2)	3.62±1.03
I actively exchanged my ideas with group members. (Question3)	3.59±1.10
I was able to develop problem solving skills through peer collaboration. (Question5)	3.53±1.03
Overall, I am satisfied with my collaborative learning experience in this course. (Question8)	3.47±1.10
Collaborative learning in my group was effective. (Question6).	3.46±1.05
Collaborative learning experience in this communication environment is better than in a face-to-face learning environment. (Question1)	2.50±1.18

Table 4: Correlation between the scores of the three questionnaires

	Mean±SD	Collaborative learning	Satisfaction	Social presence
Social presence	3.36±0.62	R=0.757 P=0.0001	R=0.78 P=0.0001	1
Satisfaction	3.20±0.86	R=0.799 P=0.0001	1	R=0.78 P=0.0001
Collaborative learning	3.45±0.76	1	R=0.799 P=0 .0001	R=0.757 P=0.0001

between the scores of the three questionnaires, the overall score for each individual questionnaire was calculated. Then, the normality of the total scores of the questionnaires was assessed by Kolmogorov-Smirnov test, and because of the normal distribution of the scores, Pearson's correlation coefficient was used. As seen in table 4, the average scores of all questionnaires are higher than the mean and near the maximum score of 4 and the correlation between the total scores of the three questionnaires was statistically significant (P<0.001). (Table 4)

Discussion

The purpose of this study was to investigate the role of PBL-based virtual group on collaborative learning, social presence and satisfaction of medical students. The findings of this study showed the average scores in all of them are higher than the mean score and near the maximum score of 4, and also the correlation between the total scores of collaborative learning, social presence and student satisfaction was statistically significant in PBL-based virtual group (P<0.001). This

significant positive correlation is similar to what Hyo-Jeong So (2008) reported in their study (22). In line with this study, several studies have found positive results in using social networks in education. Papandzadeh and Rasakh investigated the effect of using Telegram social network on teaching-learning performance, and their results showed the positive effect of that application (23).

Javadinia et al. revealed that there was a significant positive relationship between using Telegram and academic performance (24). In another study, the impact of information and communication technologies (ICTs) on staff empowerment and CME was investigated; the results showed that the application of social media and ICTs will become increasingly worthwhile in CME as younger learners continue to enter the profession (25).

Beigzadeh et al (2016) showed in their study that the average time spent on virtual social networks was 2 hours and 44 minutes per day. This finding indicates that students spend almost half of their useful time (with the elimination of bedtime and rest) in these social networks (26). Despite the extensive

use of social media among medical students, they appear to be unaware of possible ethical issues, and the guidelines in this regard should be taken into consideration (27, 28).

Amry also used WhatsApp in 2014 to train a group of 15 students, and reported that this type of training helps them create a learning community and facilitates the production and sharing of knowledge. The presence of a teacher in an online learning group should not result in reduced interactions within the group, but it is an added value that facilitates the learning.

The benefits of using WhatsApp as a social network include improved learning, availability and ease of use, portability and companionship. Today, modern education refers to an ongoing process in all times and locations as opposed to traditional education. Learning outside the classroom and through social partnerships and collaborations is increasingly taking hold as a means to improve the construction and sharing of knowledge among students (29). In their study, Duncan et al. concluded that the use of social networks in education supports participatory learning and promotes digital literacy, critical assessment skills and broader awareness of medical issues (30). Other studies have revealed that stronger bonds among classmates and friends are another educational benefit of virtual social networking. This is in line with Bicen's findings, demonstrating that connections among friends and classmates enables them to communicate with each other at any time and place, and ask their class questions to resolve ambiguities (31). According to a systematic review in the field of medical education, the most commonly reported benefits of social networking are promoting learner engagement, feedback, collaboration and professional development; moreover, these tools lead to improved knowledge, attitudes and skills (32).

The limitations of this study are the low number of students and its implementation in one training department. Therefore, it is recommended to conduct further studies on a larger scale and to examine the correlation between using this tool and students' learning outcomes.

Conclusion

The results of the present study showed that, considering the high level of participation and satisfaction among students, using social networks as a complement to traditional education is recommended.

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Ethical Declaration

This study was approved by the Ethics Committee of the Islamic Azad University of Mashhad with code.IR.IAU.MSHD. REC.1398.227. Participants willingly attended this study and data were presented anonymously. Participants were assured that their information will remain confidential.

Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author on request.

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Authors' Contribution

A.M. wrote and translate the paper. S.M.R and N.S.M implemented and collected data. A.F devised the study concept, designed the study, and supervised the research process. All of authors contributed to analysis of the study data and revised the manuscript.

Conflict of interests

The author declares that they have no conflict of interests.

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