

## ARTICLE INFO

Submitted: 21-6-2017

Accepted: 16-11-2017

Online: 29-12-2017

## Students' Perceptions of Live Online Virtual e-Problem Based Learning (LOVE-PBL) using Google Hangouts

Hazwanie Hashim<sup>1</sup>, David WK Chong<sup>1</sup>, Hui Meng Er<sup>1</sup>, Pran Kishore Deb<sup>2</sup>, Pei Se Wong<sup>1</sup>, Mun Sun Lee<sup>1</sup>, Mari Kannan Maharajan<sup>1</sup>, E Lyn Lee<sup>1</sup>, Hasnain Zafar Baloch<sup>1</sup>

<sup>1</sup>*School of Pharmacy, International Medical University (IMU), Kuala Lumpur, MALAYSIA*

<sup>2</sup>*Faculty of Pharmacy, Philadelphia University-Jordan, Philadelphia University, JORDAN*

To cite this article: Hazwanie H, David WK Chong, Er HM, Pran Kishore D, Wong PS, Lee MS, Maharajan MK, Lee EL, Baloch HZ. Student's perceptions of live online virtual e-problem based learning (LOVE-PBL) using google hangouts. *Education in Medicine Journal*. 2017;9(4):31–39. <https://doi.org/10.21315/eimj2017.9.4.4>

To link to this article: <https://doi.org/10.21315/eimj2017.9.4.4>

### ABSTRACT

**Background:** Problem based learning (PBL) is both a constructivist pedagogic philosophy and an instructional format for promoting contextual, co-operative and self-directed learning; it is traditionally conducted as face-to-face tutorials. This study explored the utility of the live online chat application Google Hangouts, which we refer to as LOVE-PBL, for running synchronous PBL tutorials that included participants in different locations. **Method:** Data were collected from student participants using a mixed-methods approach, comprising a self-administered questionnaire and focus groups. We evaluated student participants' perceptions of their learning experience and the effectiveness of online PBL via Google Hangouts. **Results:** More than 70% of participants agreed that learning outcomes were met using the Google Hangouts platform, and 50% felt that the ability to record the sessions was useful for learning and reflection. The major factors for effective online PBL were reliable internet connectivity, a conducive environment, and technical familiarity with the chat application and its functionality. **Conclusion:** Although online discussions do not fully equate to face-to-face conversations with regard to utility and enjoyment, learning outcomes are not compromised. Online chat applications thus extend the utility of PBL, and their use adds to the accessibility, flexibility and convenience that learners expect of higher education in a digital age.

**Keywords:** *Pharmacy, Problem Based Learning, e-learning, Online chats*

### CORRESPONDING AUTHOR

Hazwanie Hashim, School of Pharmacy, International Medical University (IMU), Bukit Jalil, 57000 Kuala Lumpur, Malaysia | Email: [hazwaniehashim@imu.edu.my](mailto:hazwaniehashim@imu.edu.my)

### INTRODUCTION

Problem based learning (PBL) is both a constructivist pedagogic philosophy and an instructional format for promoting contextual, co-operative and self-directed learning (1). Since its introduction in the

1970s, PBL has been widely adopted in higher education because of its student-centric nature as well as its potential to improve learning and to cultivate self-direction. In PBL, effective learning hinges upon engagement with authentic problems that stimulate exploration, activation and

clarification of existing knowledge, its elaboration and the shared construction of meaning.

PBL typically involves face-to-face interaction in a group of five to eight individuals, with a facilitator, over two or three sessions. The role of the facilitator is to stimulate active learning instead of “delivering knowledge,” as is common in didactic teaching. In an era increasingly characterised by borderless education, technological advances continue to remove constraints of location, time and space from learning. The rapid growth of electronic-learning (e-learning) has led to the introduction of online-based PBL (2). E-learning can be defined as the use of digital technology, including mobile devices, internet technologies, and a broad array of applications, that may facilitate and improve learning (3). Online technologies now enable PBL to be conducted anywhere, on any compatible device and at any time. Technology can be seen as a catalyst for massive transformation in educational systems, and educators/teachers face the continual, evolving challenge of making learning engaging and relevant to digital natives. The utility of online communications platforms can be defined in terms of their ability to closely mimic face-to-face tutorials (4), supporting efficient, holistic transmission and interpretation of both non-verbal cues and verbal messages.

The increased usage of online communications applications has led to studies comparing face-to-face and online learning. Some studies show no significant difference in learning experience between face-to-face PBL and PBL in an online environment regardless of learner styles, gender and group dynamics (5, 6). Current levels of internet connectivity, mobility and bandwidth should enable individuals in different locations to participate in synchronous PBL discussions via online communication platforms that allow participants to see and hear each other and to share learning resources. Studies have shown that online learning has the potential

to promote student-centred learning (7). The application of synchronous virtual interaction via Google Hangouts enables users to converse with and see each other and to share both online and other learning resources from remote locations. This application is accessible from any smart-mobile devices (Android, iOS, and the web) and desktop computers that commonly have built-in cameras, microphones and speakers, or support the use of headphones. Google Hangouts also has a chat box for simultaneous text messages and enables users to share their device screens or files on their devices. Conversations/interactions can be recorded and broadcast as YouTube videos, accessible via cloud storage. The present study evaluated the utility of Live Online Virtual e-Problem Based Learning (LOVE-PBL) and the perceptions of student participants about its utility, addressing the questions “How effective is an online chat application for running PBL sessions?”, and “What are users’ perceptions of the use of Google Hangouts in PBL?”

## METHODS

### Study Design

This was a mixed-methods approach study conducted at the School of Pharmacy, International Medical University, Kuala Lumpur, Malaysia. The study evaluated students’ perceptions and experiences following the LOVE-PBL through a quantitative questionnaire study, then obtained in-depth insights of representative students through focus groups. Study approval, including ethics approval, was obtained from the Centre for Education, International Medical University (Innovative Medical Education Grant ID: ILTIG 15/3). Participants provided informed consent prior to inclusion in the study. All focus group transcripts were de-identified.

All Year 4 BPharm students (179) were invited to participate in this study, and a convenience sample of 27 participants

volunteered for the LOVE-PBL. All participants had participated in PBL from Years 1 through 3. The purpose and objectives of the study were explained to all participants, and they were assured that their PBL performance would not affect their academic progress. The PBL problems (cases) were constructed for the study and not drawn from existing cases. The problems were clinical case vignettes, drawing upon the clinical pharmacy syllabus taught up to the end of Year 3. The study's PBL tutors were all faculty members with pharmacy practise background, i.e., "expert tutors", all drawn from the pool of trained and experienced tutors who regularly conducted PBL tutorials.

### **Live Online Virtual e-Problem Based Learning (LOVE-PBL)**

All participants and facilitators attended sessions to become familiarised with the use of Google Hangouts, its functions and utilities. Participants were then randomly assigned to PBL groups, each of which had four or five individuals and one tutor. Each group undertook two PBL tutorials of two sessions (nominally 1.5 hours per session) each. The first tutorial was conducted face-to-face, and the second was conducted using Google Hangouts, with all group members participating from different locations. The online sessions were recorded and uploaded to cloud storage as YouTube videos, accessible only to study participants.

Following the completion of both sessions, data were collected from participants using a mixed-methods approach: (i) a de-identified self-administered questionnaire; and (ii) focus groups conducted by faculty researchers who were not tutors for the study's PBL tutorials.

### **Study Questionnaire**

The study questionnaire was developed by researchers and content-validated by two pharmacy academics. The questionnaire was divided into four parts. The first part

consisted of demographic information including gender and academic year in which the students were enrolled, while the second part consisted of five statements that evaluated accessibility and internet connectivity. The third part consisted of nine items modified from Hassali et al. (8), which assessed experiences with LOVE-PBL. Items in Part 2 and Part 3 were rated on a 5-point Likert scale anchored on Strongly Agree and Strongly Disagree. These ratings were summarised descriptively using frequencies and percentages. Part 4 comprised two questions to elicit the use of recorded sessions of LOVE-PBL. The alpha reliability coefficient of the scale was 0.87, indicating satisfactory reliability.

### **Focus Groups**

We conducted focus groups among the participants to obtain insights about their learning experiences through LOVE-PBL. We invited all participants to the focus groups. A semi-structured interview guide with open-ended questions developed from a review of the literature and the results of the questionnaire study was used (Table 1). The interview guide started with an open question to gather participants' experiences with the online PBL. Subsequent questions were used to gain more in-depth information related to experiences and insights in the use of Google Hangouts, the factors that influenced online engagement, as well as barriers and facilitators.

To ensure that the participants were comfortable in expressing their opinions freely, the focus groups were conducted by two researchers (HME and HH) who were not tutors in the PBL sessions. Both researchers are pharmacy academics familiar with the PBL process and the conduct of focus groups. All focus group discussions were audio taped, transcribed verbatim and analysed using the General Inductive Approach. The first transcript was independently coded by two of the researchers (PSW and ELL) to generate a coding list. Based on the coding list, the

**Table 1:** Focus group open-ended questions

<ol style="list-style-type: none"> <li>1. What do you think about LOVE-PBL? <ul style="list-style-type: none"> <li>• What did you enjoy, and why?</li> <li>• What did you not enjoy, and why?</li> </ul> </li> <li>2. What do you think about the applications in Google Hangouts? <ul style="list-style-type: none"> <li>• How do you feel being recorded during your LOVE-PBL?</li> <li>• What challenges did you face in the LOVE-PBL?</li> <li>• What are your suggestions for improving your LOVE-PBL experiences?</li> </ul> </li> <li>3. How do you think using Google Hangouts affected your engagement, compared to face-to-face? <ul style="list-style-type: none"> <li>• What do you think about the suitability of the case for the LOVE-PBL?</li> <li>• What did the tutors do to engage the members of your group?</li> <li>• From your observations, how did individuals' communications change when communicating online, compared to face-to-face?</li> </ul> </li> <li>4. Of the teaching and learning activities in which you have experienced, what types of teaching and learning activities can use Google Hangouts? <ul style="list-style-type: none"> <li>• How do you think Google Hangouts might make them better for students or teachers?</li> </ul> </li> </ol>
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remaining transcripts were coded. The codes were developed until all transcripts had been analysed. The researchers discussed and agreed on the development of the codes and themes to maximise reliability and credibility of analysis. Although data were transcribed verbatim, sounds and words that did not contribute to the main message in the participant quotes in this study were removed. Some explanations were added in parentheses to improve the overall readability of the quotes.

## RESULTS

### Perceptions and Experiences of LOVE-PBL

A total of 27 participants attended the LOVE-PBL and completed the questionnaire. The alpha reliability coefficient of the scale was 0.87. The majority of participants (67%) had not used Google Hangouts before taking part in this study. Participants' perceptions of LOVE-PBL are shown in Table 2. Most participants agreed or strongly agreed that they enjoyed the sessions (59.2%) and that the learning outcomes for the session were met (77.8%). With regard to engagement, 44.4% of

participants agreed or strongly agreed that they were able to engage with their group members during the session. Overall, 85.2% of the participants agreed or strongly agreed that the sessions effectively helped them to learn.

### Recorded Sessions

Most participants (66.6%) reviewed the recorded LOVE-PBL sessions, and 50% felt that the recordings helped their learning and reflection. One feature of Google Hangouts, called Hangouts On Air with YouTube Live streaming, allows the session to be recorded. Despite this open feature, Google Hangouts protects users' profiles by enabling users to control who can view the broadcast.

### Accessibility and Internet Connection

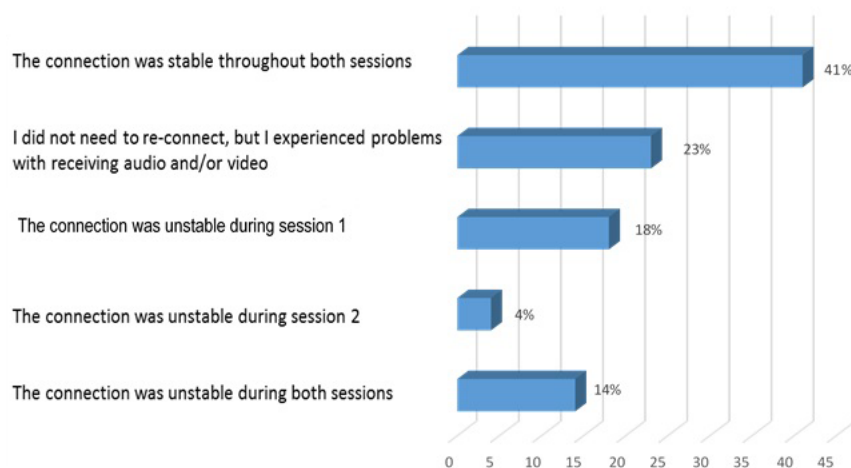
After the online sessions, 40.7% of participants agreed or strongly agreed that the Google Hangouts platform was easy to use. Most participants (63%) took part from home; 4% and 14% of participants had internet connectivity issues in Session 1 and Session 2, respectively (Figure 1). They also reported audio and video problems.

**Table 2:** Perceptions and experiences of LOVE-PBL and “recorded session”

Statements	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Overall, the sessions effectively helped me to learn.	7 (25.9)	16 (59.3)	2 (7.4)	1 (3.7)	1 (3.7)	27 (100)
The sessions met the learning outcomes.	5 (18.5)	16 (59.3)	6 (22.2)	0 (0)	0 (0)	27 (100)
I enjoyed the sessions.	3 (11.1)	13 (48.1)	5 (18.5)	6 (22.2)	0 (0)	27 (100)
Google Hangouts is easy to use.	2 (7.4)	9 (33.3)	8 (29.6)	5 (18.5)	3 (11.1)	27 (100)
I was able to engage with my PBL group members during the LOVE-PBL sessions.	2 (7.4)	10 (37.0)	11 (40.7)	3 (11.1)	1 (3.7)	27 (100)
Google Hangouts is a suitable platform to conduct PBL.	0 (0)	6 (22.2)	6 (22.2)	9 (33.3)	6 (22.2)	27 (100)
Discussion using Google Hangouts is as effective as face-to-face PBL discussion.	0 (0)	3 (11.1)	5 (18.5)	10 (37.0)	9 (33.3)	27 (100)
It is fair to assess student participation in the sessions.	1 (3.7)	11 (40.7)	10 (37)	2 (7.4)	3 (11.1)	27 (100)
I would recommend Google Hangouts for PBL to classmates who did not take part in this study.	0 (0)	9 (33.3)	8 (29.6)	5 (18.5)	5 (18.5)	27 (100)

	Yes, N (%)	No, N (%)
Did you review any of the recorded sessions of LOVE-PBL?	18 (66.6%)	9 (33.3%)
If you reviewed the recorded Google Hangout sessions, did doing so help you to reflect on your learning?	9 (50%)	9 (50%)



**Figure 1:** Internet connection feedbacks.

### Comparison with Face-to-Face PBL

Compared to face-to-face PBL, only 11.1% of participants agreed that using Google Hangouts was as effective. The majority did not prefer using this platform over face-to-face PBL (81.5%), and 55.5% disagreed or strongly disagreed that Google Hangouts is a suitable platform for PBL.

### Learning Experiences Through LOVE-PBL

Eleven out of 27 study participants took part in the focus group interviews. The study participants were divided into two focus groups, with six participants in the first focus group and five in the second group. Each focus group took approximately 35 to 40 minutes. Themes identified from the transcripts may be categorised as (i)

positive experiences with LOVE-PBL and (ii) barriers and challenges in the online environment. Table 3 shows a summary of themes and illustrative quotations from the participants.

Focus group participants extensively discussed their experiences with LOVE-PBL. They discussed being able to take part in PBL despite being away from campus and enjoying the convenience of not needing to travel to campus; they believed it was also more convenient for tutors. Most participants also enjoyed the features of Google Hangouts, particularly the ability to share and record. Sharing features allowed them to share links and articles during discussion. The “recording” feature allowed play-back that was useful for those who missed the session.

**Table 3:** Themes and illustrative quotations

Theme	Illustrative quotations
Positive experiences	<p>I really prefer Google Hangout session because, for example, I am in New Zealand, I can even talk to everyone in Malaysia. Or somehow if I am going to some place to buy something, and I am not in front of my computer, I can also use by using the smartphone. [I3S6]</p> <p>I would say the recording part, because for me, even though I'm the audience, I know what's going on. So, I think I like that about the Google Hangout. Like even if you are disconnected right, you can still go back and be the audience and you are still participating somehow. [I3S3]</p> <p>We can also share the articles' link, and then as we discuss, we can open the link and look at the article online. [I2S1]</p> <p>Google Hangout can carry out during discussion with the lecturer, like some informal discussion. Because during sem (Semester) 7 we also tend to have to meet lecturers quite often. Lecturer also very very busy. So if got Google Hangout then we can contact with them quite often also. [I3S4]</p>
Barriers and challenges	<p>And this room is terrible, and when we are talking, it's like the sentence is cut into pieces. [I1S2]</p> <p>I think there is another member who conduct it at home but she's (another participant) facing some problem, like she connected but she cannot hear what is. [I1S1]</p> <p>I mean the flow actually is not very good because you have to wait for someone to finish their talking. You cannot; it's very hard to interrupt. [I3S2]</p> <p>As the trigger is a little bit complicated for Trigger 2, so I think the facilitator should upload it a little bit earlier. She upload it 10 minutes before the session and is too many pages and we take time to print it out and then after we print it out, the session is almost; the time is almost started already. And we are like spending time on the trigger. [I1S2]</p>

Participants also highlighted barriers and challenges that affected their learning experience with LOVE-PBL. When asked about engagement and communication during LOVE-PBL, the majority mentioned that their communication was not ideal. One participant said that sentences were cut into pieces during online communication, while some reported having to wait for their turn to speak. Participants also mentioned that bandwidth varied greatly between locations, which affected their connectivity and thus their level of communication. Other challenges that participants discussed extensively were the clinical case (trigger); most participants found the clinical case too complex. The time allocated to read and discuss the case was insufficient. Participants suggested that the case be uploaded online before the session to provide more reading time.

## DISCUSSION

Online chat applications should enable PBL tutorials to accommodate participation from different locations, in real time, provided these applications (4) allow efficient, holistic communication. In this regard, our exploratory-evaluative study not only demonstrated the utility of LOVE-PBL but also identified associated limitations and advantages. The advantages are the ability to access the discussions from any location with internet connectivity; the ability to instantly share learning material; and the option of recording or saving the sessions as YouTube videos for later review – this was valued by study participants. Studies suggest that video is a powerful tool for objective reflection on performance (9, 10). Review itself facilitates this reflection, develops the cognitive schemata for problem solving and decision making in healthcare communications (11), and may promote development of meta-cognition. The chief limitation is the reliance upon sufficient bandwidth and uninterrupted internet connectivity. This limitation could be exacerbated by the group sizes (10 students)

typically used in our setting: the study PBL groups contained only four to five students each. To address this, online communication ground rules could be set (12). However, the effect on spontaneity, and thus group dynamics, needs to be further evaluated: Participants commented that online interaction was not as spontaneous as face-to-face interaction, and they said that they preferred face-to-face sessions.

The study used convenience sampling, recruiting volunteers who were senior students and interested in exploring the use of Google Hangouts in “formal classes”. We are thus cautious in generalising their engagement, responses and perceptions to the remainder of their large cohort. As this is a cohort of digital natives, a generally positive attitude towards the use of online chat applications may be anticipated, but a positive attitude towards its use for academic work cannot be assumed. A pilot study by Ng et al. (13) indicated that use of web conferencing application (Adobe Connect) for PBL was effective and popular. The ability of Google Hangouts to support the PBL group sizes (10 to 12 individuals) typically used in our setting must also be evaluated.

Entirely new PBL cases were constructed for the study rather than using or modifying existing cases. In hindsight, using previously evaluated cases (that participants had not encountered before) would have avoided potentially confounding the study by participant difficulty with cases in a new or unexpected format, and not by the online application. The new cases each comprised several A4 pages of patient case notes and laboratory investigation data, accessible online only from Session 1 of each PBL tutor. Participants commented that the length and (perceived) complexity of the cases was challenging. Use of the material was inhibited by not having paper copies; participants suggested allowing download of the materials ahead of the PBL, to enable printing.

In this study, the learning outcomes are not compromised via LOVE-PBL: 77.8% of participants agreed that learning outcomes were met despite challenges and barriers. This could be due to the nature of learning in PBL itself, which involves identifying gaps in learning, searching, and analysis of ideas and information, all of which promote the achievement of learning outcomes. Despite positive responses on learning, 70.3% of the participants disagreed that online PBL is as effective as face-to-face PBL. Focus group participants commented on that unstable internet connections and poor audio quality hindered smooth group discussion. The effectiveness of LOVE-PBL in this respect needs further evaluation of technical aspects and the environment. The study did not evaluate the extent to which group members used Google Hangouts or any other online platform in the period between formal sessions, which is used for searching for and learning information to be discussed and presented in Session 2. This period between formal sessions may include smaller, perhaps ad hoc discussions and is the time when most actual learning occurs. This major omission needs to be addressed in further work. A study by de Leng et al. (14) of the use of a virtual learning environment (VLE, e.g., Blackboard) in face-to-face PBL tutorials found that the VLE stimulated interactions in both PBL sessions, but distance interaction was not stimulated via the VLE.

The successful use of LOVE-PBL largely depends on (i) internet connectivity, (ii) user familiarity with the platform/application, and (iii) special features that enable recording of PBL sessions via the Hangouts On Air application. Whilst Google Hangouts features can enhance the learning experience, internet accessibility and bandwidth are the main limiting factors.

## CONCLUSION

Despite its limitations, this study supports the effectiveness of an online chat application for conducting synchronous

PBL where participants are geographically distributed. The utility and enjoyment of online PBL does not equate fully to face-to-face sessions. Further study of environmental and technical aspects is required to augment these findings. Online learning enhances accessibility, flexibility and convenience, factors that continue to increase in importance in higher education.

## ACKNOWLEDGEMENTS

The authors wish to acknowledge the invaluable contribution of the BPharm students from the BP112 Cohort who participated in this study. We would also acknowledge Dr. Pran Kishore, Deb (co-author) for innovatively coining the term LOVE-PBL. The authors are also thankful to the International Medical University Centre of Education for providing study and ethics approval, and for funding the project (Innovative Medical Education Grant ID: ILTIG 15/3).

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