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Using Online Digital Tools and Video to Support International Problem-based Learning

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Abstract
The goal of this study is to examine how to facilitate cross-cultural groups in problem-based learning (PBL) using video triggers and computer-based technology tools. Medical students from Asia and North America participated in two sessions and watched physicians deliver bad news to a patient in two video cases. Experienced facilitators help support collaboration in the two PBL sessions. An expert facilitator provided advice using a chat box in the video conferencing system. This study examines strategies and challenges in facilitating PBL across distance and cultures using both an inductive analysis and Community of Inquiry analysis scheme. Several conjectures were developed for future research.

1. Introduction

Today, designing any educational experience requires a critical review of the characteristics of the cultures and the needs of the local community [1]. Culturally competent communication is an important physician attribute in increasingly multicultural societies [2]. However, there are many ways that this might be approached [3]. In this context, online problem-based learning (PBL) may be a promising approach to meet the needs of a wider population of students that can bring learners together across cultures [4]. We do so in this study by introducing students from two different continents to PBL-online tools that help them work together as a team. We used synchronous collaboration tools such as video conferencing, chat, and shared whiteboards to support effective collaboration online. PBL supports collaborative knowledge construction and in the process learners develop skills of critical analysis, problem solving and content knowledge [5]. This research focuses on the affordances of technology for facilitating cross-cultural engagement in online PBL.

Technology can create communities of learners across international boundaries [6-8]. Grounded in a socio-constructive theory of learning, the Community of Inquiry (CoI) framework focuses on a process oriented approach by which meaning is constructed through online discussions. According to this framework, an online community emerges as a result of the relationship between the three interdependent elements of online learning: social presence, teaching presence and cognitive presence [9]. These elements are essential for higher order learning.

Videos provide both contexts and communication spaces that can support collaborative engagement which we define as students taking responsibility for generating, supporting, and building understanding in small group activities. Previous research suggests that videos have the potential to foster the development of a community of inquiry [10].

Facilitating PBL across countries is a novel pedagogical method for learning about issues and practices in relation to different cultural contexts. “Less is known about the use of PBL in the electronic-based distance-education "virtual classroom," due to the relative novelty of electronic-based distance education” [11]. This research will help to understand practices for facilitating and guiding PBL in culturally and geographically diverse groups. Additionally, this research can be seen as an attempt to highlight the
affordances and constraints of the video conferencing environment for supporting collaborative engagement across cultures. Facilitating PBL is a demanding practice that requires a repertoire of strategies to guide the learning process [12, 13]. This practice is even more difficult when introducing new technology, working with students who have just met, and working with new content problems that have high emotional content as in this study. However, despite such challenges, technology can afford additional support mechanisms for real-time coaching that are not available when PBL is conducted in a face-to-face setting.

2. Design of PBL sessions

The context for this study was two video-based medical scenarios, one set in North America, another set in Asia that were used to facilitate two-hour online PBL sessions that focused on educating medical students about communicating bad news. The project was conducted in two broad phases. In Phase I, two online PBL sessions which started with students watching a video of a physician delivering bad news to a patient.

The goals for the PBL module were for students to be able to:

1. List difficulties in communicating bad news to a patient with strategies for addressing these issues.
2. Describe one way of approaching a bad news communication session (SPIKES)
3. Use the SPIKES model to analyze a video of a bad news communication session
4. Discuss and reflect on how the use of the SPIKES model may have to be changed in response to context, culture and language barriers.

The SPIKES acronym represents Setting up the interview, focusing on Perceptions of the patient, Invitation (for how the patient would like to hear the information), Knowledge-sharing, Emotions, Strategy and Summary [14].

The PBL group was facilitated for one session by a tutor from North America (Figure 1) and for a second separate session by a tutor from Asia. The physician-educator who represented the country from which the video case was drawn facilitated each session. In this activity, an expert PBL facilitator supported these physician-educators using the chat windows integrated in the video conferencing system during each PBL session. This chat window was only visible by the physician educators. In phase II, using adobe connect all four students individually practiced giving bad news with the help of a standardized patient. Our focus here is on Phase 1.

Adobe Connect was chosen as the video conferencing software for its cross-platform capabilities, its features and stability, and ease of recording the actions in the meetings. Besides its simple interface and easy navigation, Adobe Connect supported collaborative engagement through audio, video, and text (see Figure 1).

3. Methods

The participants in this study were 4 medical students, two from Canada (C1 and C2) and two from Hong Kong (HK1 and HK2) along with an experienced physician educator from each country (CPE, HKPE) as well as an expert in PBL facilitation (EF) from the USA. Both sessions were conducted in English. The video of a Canadian physician and patient was in English; the video from Hong Kong was in Cantonese with English subtitles. Data sources included transcripts of PBL sessions, chat logs, and focus group transcripts. All data were uploaded into a qualitative data analysis program. The data were analyzed inductively and deductively for significant themes and patterns. In the exploratory analysis, we looked for themes related to culture, facilitation, and affordances and constraints of the technology.

In addition, we examined the nature of interactions between the facilitators and medical students that created the social, teaching, and cognitive presences.
Deductive coding was largely informed by community of Inquiry (CoI) framework. Data was deductively coded using indicators provided in the form of key words/phrases under each category of presence namely teaching, social, and cognitive. These indicators served as an outline for the researchers to analyze the data. The unit of analysis was a conversational turn and not more than three codes were given to a single turn. Few turns were long enough to have more than three codes; if so, they were parsed into two turns. The descriptive information on number of turns, frequencies of each indicator under all three presences, and codes for each speaker for different indicators were obtained through this analysis.

4. Results

We present the results in two separate analyses. In the first analysis, we show examples of ways in which the students were engaged in cross-cultural discourse and how that was facilitated. We anticipated that our inductive analysis might find parallels in the Communities of Inquiry coding because of these attributes are congruent with the goals of problem-based learning, which has parallels with the cognitive, teacher, and social presence described in the Garrison et al model. However, we were not sure how the online environment and cultural differences would attenuate these characteristics. The second analysis presents these results.

4.1. Inductive analysis

Students were highly engaged in the PBL activities. On PBL day one, there were 231 turns of talk. The first 47 of these were related to getting started with the technology and dealing with issues of technical limitations and how to work around them. For example, there were some issues with getting the whiteboard to work properly and the Canadian Facilitator and one of the Hong Kong students worked together to figure out that they could use the chat as a workaround to use in place of the whiteboard. They also discussed being aware of time delays in using the system. The facilitator made a point of telling the students that the “student leader role” and “scribe roles” would be rotated among students from both countries over the two days. All students were involved in the discussion. Students sometimes raised issues about practices in the other country as in this example when one of the Hong Kong students asked: 1

I am just wondering, the video I guess is taking [place] in Canada, what are the procedures like are about testing like for HIV. Is... throughout the

1 Indented text used for extended quotes
video, my thoughts in thinking cuz in Hong Kong what happens is we have to get consents from the patient when we test for HIV viruses. And so in that sense um so, so that the patient would already given consent for HIV to be tested, that means they would have some sort of expectation already, so I am not sure ar is this the case in Canada? ...  

The facilitator helped keep the group on track in terms of the PBL process and clarifications. The expert facilitator (EF) provided occasional suggestions in the chat window that generally focused on PBL process and group dynamics. As in this next example when the EF suggested “How will you organize facts, ideas, learning issues. Might you want to use a shared word document?” and “You might want to get HK1 talking as well as writing so as to keep the scribe involved.” The Canadian physician educator (CPE) judged the second of these suggestions to be more important and a few turns later said “I know, HK2, why don’t we look at what HK2 has written, HK2 could you um.. Could you show us what you’ve written go through what you’ve already embedded, and tell us what you might get out of that.” EF reminded CPE that the students were confusing facts from the case with their ideas about how to give bad news and this time CPE took up this suggestion and asked the students about that.

In the second PBL session, the physician educator from Hong Kong (HKPE) facilitated and EF again monitored the discussion. Again, all students were involved in the discussion and there was substantial cross-talk among students from the two countries. On day 2, the technology worked relatively smoothly and only the first 7 of a total of 438 turns were needed to get the group past any technology-related issues and into the substance of the PBL sessions.

In this session there were again discussions of cultural differences, but these were easier to explicitly facilitate as now the students each had points of reference from both cultural contexts (after having watched both the Canadian and Hong Kong videos):

HKPE: ...What did you think was the perception of the patient in the video, um do you think the patient is very shock by the way that the doctor deliver that news to him? Or do you think that was completely normal in his mind. ... Let me put it that way, if that doctor um was transplant into Canada, is that doctor gave same bad news to a patient to a Canadian patient in the same manner. Do you think the patient would react differently?

C2: Very likely I’ll say

HKPE: um well obviously, I don’t think we can say ok that this is a typical patient ar what a patient, what a patient would typically react in Hong Kong but... supposed we are just making an assumption that this is a typical patient ar, how, how they would react to that kind of bad news to Hong Kong, and you was thinking that um are in a different country the patient would react in a different way. Right?

C2: Very likely but ... I would just say that, there ar yes in Canada probably because of the history with ... people people coming from a lot of different places. We can end up with a lot of different variability in terms of the type of responses you might get from the patient because of their background and so it’ll be a little bit hard harder to make to say what a typical response might be.

HKPE: Well ... same in Hong Kong I suppose...Basically you are saying the ar the Hong Kong patient we saw on the video was reacting in a very calm way...What do you think HK2? is it?, I mean, and HK1 as well seems you were more familiar with the situation, the cultural situation, context in Hong Kong. Would you say that is probably way, a lot of people in Hong Kong, Asian cultural would react in that kind of situation?

HK2: I would say um it is quite typical, because as you know in Hong Kong the consultation time would be less than 10 minutes for each patient. Um so I would say most case it would not expecting any sort of patient physician communication...

C1: I think for me, it is very useful to have um an acronym like "SPIKE" I think it is a good thing because ... I think that it allow us to focus more on the patient as supposed to you know trying to ....you know it actually allow to actually to spend more time on the patient in reading the expression which is something important you know, so in a true sense it helps to focus more on the patient ...so I find it very useful.

HKPE: What about HK1?... you have experienced Hong Kong culture versus Australian culture

HK1: I think I could be....the bridge between ...Canada and Hong Kong for this, cuz ... I have seen both versions, so... I agree with HK2 that I mean in the consultation video that we’ve just watched would be very typical of a Hong Kong hospital or even worse, I mean some doctor just go in and say Hey you are HIV positive, so I mean the reaction of the patient I
think its…acceptable and predictable from the
general hospital environment we have and I
mean and in the Chinese culture we also tended
to be…less expressive in facial emotions, I
mean …it probably won’t expect us be jumping
around and expressing … happiness or sadness
anyways, so whatever that the patient had seen
in that video was quite acceptable in the
Chinese culture, but … my experiences in
Australian…hospital is…. you can say that the
issues that patients were worrying about is
common across all races, there has been
stereotypes and stuff, but it is just like I guess
for those in the western countries you would
expected to see a bit more … maybe in as a
depression as a surprise or shock, …

HKPE: …I think um perhaps it is kinda
difficult …to have a discussion on… western
culture or Asian culture because these are
all…changing dynamic and you know, but but
there are all different cultures, you know ways
of doing things, react to things, thinking about
things... in different countries. I mean it is even
different in one family then in a different
family, let alone different countries with
different history, different society you know, so
um, what I am trying to say is, at…what I am
trying to think about is um, obviously the
patient and the doctor in today’s video seems to
be very you know not very emotional, both the
patient and the doctor are right, just now we are
thinking about the patient is very calm and you
know, 10 to 15 minutes ago we were also
saying the doctor were very…flat, in terms of
tone and facial expression, so they are both kind
of, rather you know I mean unemotional you
know in that kind of emotional situation, so I
was just trying to understand that um in terms
of any cultural differences, but I don’t know.

HK1: I think you need. You need a different
scale of sensitivity when you are um assessing
for emotion of patient of from different races. I
mean for the Chinese video that we’ve seen
today… I personally applied a higher level of
sensitivity I was observing for every single
facial expression... here as for the video
yesterday, was quite easy… I don’t have to look
actively for physical changes, cuz I mean from
the whole posture of the patient I was able to
walk away with enough information so I mean
…that’s just me adding back um sensitivity
definitely as to adjust when you are facing
different culture, background.

In this extended discussion, the group spent a great
deal of time in discussing the differences across
cultures. The students brought in their own
experiences from their own culture, and they made
comparisons with the video that they saw on Day 1. C1
also related the discussion to the SPIKE protocol [14]
that the students had been given as one way to deliver
bad news. Moreover, the students also realized that it
was hard to generalize the cultural differences because
personality comes into play. Additionally, the students
felt that they would need more experiences to make
any conclusions about whether there were cultural
norms.

Similar to the first day, the EF provided advice on
the PBL process and group dynamics. Again, some of
this included suggestions on how to organize the chat
screen being used as a whiteboard, suggesting”

Perhaps ask students to go over the whiteboard
and remind them that they need to get ideas down.
Maybe get suggestions for how to organize ideas--
can what they learned from SPIKES
framework…” Shortly after that HKPE suggested
to the students “Looking at the at the white board,
so we have um quite a number of facts directly
from the video. Okay, can we also start to think
about …the ideas that we have about the ar
performance of the doctor in the video how he
should or should not ha ve, in our opinion, …
communicating the bad news to the patient. Can
we um, can we also you know jot down some of
these ideas, that these great ideas, um start
organizing our you know our  thoughts about what
gone really well in the video or not to mention too
many ar, and what are the improvements we
would suggest…, or … you would do if you were
the doctor…

In the focus group following the two PBL sessions,
the issue of culture remained salient. CPE noted that
despite the cultural differences that divided them, there
was also a common medical culture, which they
shared:

… What really surprised me about these sessions
this week, I was thinking was that everybody
comes to any session with their own culture. HK1
and HK2 with your own cultures, having been
brought up in Australia and/or HK. C2 and C1
having lived at least a good part of their lives in
Montreal. Me having lived in Montreal. So each of
us bring our own culture to our medical work. But
there is another culture that we all have and which
I thought was very well demonstrated during this
entire week. Medical Culture, there is a culture
that physicians share that seems to me to be universal. What I was surprised was the smoothness with which C1, C2, HK1, HK2 just went into discussing the patient. I was surprised during the entire time that we planned this session. And the ease with which myself and HKPE. It was obvious what was next to being done for each of these different learning sessions. Here I would argue, that we were using our culture as physicians and so what was really interesting C1, HK2, C2, and HK1 you come from completely different cultural backgrounds and you have rather different backgrounds in terms of medical education and each of you are not even perfectly matched in terms of where you are in you are in respective medical schools. Yet, when we got together around these patients there was an understanding that we had of what was important and what wasn’t. I found that actually surprising and I thought we’d had much more difficulty but I am surprised at the ease with which we were able to do this.

Both physician educators noted that despite the issues with the technology, it allowed them to bring this group together. During post problem reflection, HK1 noted that the technology forced delay actually required students to listen to what each other said and not interrupt each other. After HKPE asked HK1 about why they were less polite in their normal HK groups, HK1 responded

Well, well judging from everybody is waiting for other’s to speak… I think that’s a good, I think that’s a good, rarity, you don’t get that a lot in PBL groups, some are really aggressive from what I’ve seen, but today there is a lot of mutual respect and we also understood that there is ar technical delays so. I mean there was heaps of silence, because we have nothing to say, we just waiting for someone to speak up, so I mean um, we are definitely polite in that sense.

A few turns later, C2 jumped in, concurring with HK1’s assessment, partly also because of the time delay:

As… we are giving some other people the ar the opportunity to speak we’re… waiting I guess, there would be a longer time delay and ar, sometimes we end up stepping on each other’s toes a bit. But ar, we don’t, at least we don’t end up having two people continuing on ar you know, disrespect of each other.

In the focus group, the students agreed that although this was hard, it was also unique and rewarding. HK1’s last focus group comment summed things up well:

I think the whole international theme that went on the for … PBL really reminded me of being in Australia. Where you get a group of Caucasian people sitting with Asian people in the rooms chatting about the patients and trying to critique on how things can be improved. What I am trying get here is that different colors, different cultures, different language experience or even knowledge experience I think it really just really shows that we are living in a global village where we could acknowledge common themes, acknowledge common facts, and ideas that are very much comparable.

This last comment made it clear that the students themselves were cognizant of the opportunities and importance of interacting across distances.

4.2. Community of Inquiry Analysis

Col has been specifically developed to understand inquiry-based learning in online environments [16]. The three categories teaching presence, social presence, and cognitive presence under Col framework describe the learning experience in the online environment. Social presence defines the ability of the students to present themselves in an online environment as “real people” [17]. Cognitive presence is associated with critical thinking and is described by the phases of practical inquiry model namely triggering event, exploration, integration, and resolution. Teaching presence describes the role of an online facilitator. Establishing curriculum, rules of engagement, providing timely information and feedback, and monitoring student activities are all activities associated with active teaching presence. The long-term goal of teaching presence is to enhance social presence and cognitive presence, thereby promoting student learning [18].

In the first PBL session, a total of 234 turns were coded. The most frequent indicators coded in this session were direct instruction (63) under teaching presence, group cohesion (37) under social presence, and exploration (34) under cognitive presence. Further detail is provided in Table 1 for the first session and Table 2 for the second session.

Initially, the task of providing for teaching presence was vested with the facilitator, however, as
the session progressed students also provided for teaching presence. The instructional design codes were primarily related to the facilitator. Students’ contribution to teaching presence was more visible in facilitating discourse.

Table 1. Frequency of codes in session 1

<table>
<thead>
<tr>
<th>Category</th>
<th>Codes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Presence</td>
<td>Facilitating Discourse</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Direct Instructions</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>Instructional Design</td>
<td>34</td>
</tr>
<tr>
<td>Social Presence</td>
<td>Open Communication</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Personal Projection</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Group Cohesion</td>
<td>37</td>
</tr>
<tr>
<td>Cognitive Presence</td>
<td>Triggering Event</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Exploration</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Integration</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Resolution</td>
<td>2</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>234</td>
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</table>

All the cognitive presence (45) codes were related to the student turns. Only 5% of the total cognitive presence turns was coded as resolution phase. The resolution phase is defined as the highest level of cognitive presence where students test the applicability of their ideas. The majority of the comments were exploratory in nature; hence, the progression to resolution phase was very limited. This finding of low level higher order learning supports earlier research [19]. Few possible reasons for low resolution activity may be a shortage of time, nature of the problem being discussed, and instructional design of the PBL session.

The facilitators and students provided social presence in this session. Approximately 25% of the total codes was coded as social presence. The facilitator’s contribution to social presence was in the form of group cohesion, whereas the majority of the students’ codes were related to open communication.

The second PBL session had a total of 266 coded messages. Since, this was the second session, students were already familiar with the tasks, process, and technology. This is supported by the reduced count of instructional design codes. The CoI framework operationalizes instructional design as activities and messages associated with setting targets, timelines, and designing methods. This session had only 10 instructional design codes as compared to 34 in the previous one. Additionally, due to the nature of instructional design activities, it is mostly the responsibility of the facilitator to provide for instructional design. Only 91 messages in this session were from the facilitator as compared to 125 from the previous session.

The most frequent indicators from this session were similar to the previous session. Direct instruction was coded 80 times followed by group cohesion 56 times, and exploration 43 times. There was an increase in integration codes, which may be a good indicator of creation of community of learners over time.

Table 2. Frequency of codes in session 2

<table>
<thead>
<tr>
<th>Category</th>
<th>Codes</th>
<th>Total</th>
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<tr>
<td>Teaching Presence</td>
<td>Facilitating Discourse</td>
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</tr>
<tr>
<td></td>
<td>Direct Instructions</td>
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<td>Instructional Design</td>
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<td>Social Presence</td>
<td>Open Communication</td>
<td>17</td>
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<td></td>
<td>Personal Projection</td>
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<tr>
<td></td>
<td>Group Cohesion</td>
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<td>Cognitive Presence</td>
<td>Triggering Event</td>
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</tr>
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</tr>
<tr>
<td>Grand Total</td>
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<td>266</td>
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Good facilitation of PBL session is a requirement for success of this process [20]. These results suggest that both these sessions were well facilitated, though it was somewhat surprising that there was as much direct instruction as we observed. We say that these sessions were well-facilitated because of both the quality and quantity of discourse, with all the students involved. This may have occurred in part because of the need to orient the students in this short time span. An increased open communication activity indicates risk free expression and a climate of trust [21]. Our findings support the previous work and confirm that increased open communications lead to stronger group cohesion [21]. Also, a decline in personal projection student activity may be due to the cultural difference and different facilitating styles of the two physician educators.

To conclude, both the physician-educators were able to develop a high level of social presence in a very
short time. This may be attributed to physician’s expert facilitation and the synchronous environment. Synchronous environment gave students an opportunity to hear and see each other live, get immediate feedback, and finish the tasks within a short time.

5. Discussion
As a proof of concept, this exploratory study demonstrated several interesting phenomena. First, it was possible to engage students from different cultures in a PBL experience. Despite the technology issues, which were manageable, but nontrivial, we were able to connect students and facilitators across the oceans. The students managed to overlook the technical difficulties and saw the positive aspects of an enforced delay in terms of politeness and time for reflection.

Second, it was particularly interesting that culture was an explicit item that the group brought into discussion. Students appreciated that there were cultural differences that they needed to understand. CPE noted that what might have supported this collaborative PBL experience was the common culture of medicine.

Finally, the technology supported just in time professional development and support for the facilitators. Although both of these facilitators were experienced, the additional cognitive load of technology made it helpful to have another pair of eyes helping to monitor the discussions and keep an eye on the PBL process. The use of multiple collaboration spaces in the videoconferencing software made supporting the facilitators tractable. This may have important potential in training facilitators.

The CoI model [14] provided a framework for analyzing the relationship between the teacher/facilitators and student interactions from a teacher presence perspective as well as cognitive and social presence perspective. The data reveal that the technology-enhanced PBL provided a rich environment for learning about how to communicate bad news to patients. Both facilitators provided appropriate amounts of direct instruction that were moderated by an expert PBL facilitator. Student discourse demonstrated social presence as well as cognitive presence that tended to increase over the two case presentations. Given the short duration of the PBL intervention, two hours, the amount of social cohesion among the group is impressive, as is the meaning making that was coded in the cognitive presence category.

Based on this exploratory study, we have identified several conjectures that will be important for scaling this to a larger trial. First, video triggers that address both cognitive and emotional issues may be effective boundary objects for bringing medical students together to collaborate across cultures. Second, given the complexity of this type of intervention, an expert facilitator can provide just-in-time coaching. It may be important to determine the extent to which such coaching can continue with a larger number of groups. Third, the technology, context and human facilitation appear to support the teaching, social, and cognitive presences needed for inter subjective meaning-making. These conjectures will all need to be tested in a larger study with multiple groups over extended time scales. These tests will be important both theoretically and pragmatically. We need to be able to answer big questions about how can we do synchronous groups like this in existing curriculum contexts? Can we have more than one instructor and larger classes? Does this kind of PBL have to be all synchronous or can we have opportunities to scale up with other communication modalities that might be asynchronous?

To conclude, this has been a fruitful demonstration, but putting this together across time and space was challenging. Organizing time, technology, and bandwidths required a great deal of coordination—although this seems obvious, it is worth repeating. Selecting topics that would be of interest and that would promote extensive discussion among students who came from different cultural contexts was another key factor in the success of this PBL. But it was the students who noted the importance of understanding that they live in a global village and that they needed to understand what they had in common along with what was different. The findings from this study can be useful for faculty development in conducting online PBL especially in cross-cultural settings. More research is required to understand the facilitation strategies that promote higher order learning. Further analysis needs to be conducted to examine how participation in these online sessions is related to what students learned as demonstrated by their performance assessments.

6. References


Acknowledgements

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