A case study of teaching presence in virtual problem-based learning groups

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ABSTRACT

Interest in conducting problem-based learning (PBL) on-line has increased to meet student and physician schedules. Little research describes skills needed to facilitate PBL on-line. In this paper we studied teaching presence in asynchronous PBL groups. Two raters, with average inter-rater agreements of 0.80, used an existing code to measure teaching presence in 62 PBL case discussions facilitated by one instructor over five years. This instructor was selected because of consistently high teaching evaluations. Messages sent by the instructor in the on-line PBL discussion were coded into three categories: instructional design and organization, facilitating discourse and direct instruction. Instructional design indicators were most frequent averaging 22.5 (SD = 5.6)/discussion. Facilitating discourse and direct instruction were comparable, 19.5 (SD = 7.4) and 19.5 (SD = 6.7), respectively. Messages and indicators of teacher presence rose across time with a decline during subsequent PBL cases with the same group.

Introduction

Project LIVE (Learning through Interactive Video Education) is a program for conducting problem-based learning (PBL) with dispersed students (Kamin et al., 1999). PBL cases are progressively disclosed to students with digital video of patient/physician encounters while groups of four to six students at different clinical sites and a faculty facilitator discuss the case asynchronously. As we train new faculty to facilitate on-line PBL, we sought a deeper level of understanding of the role of the on-line facilitator.

Little literature was found on conducting PBL at a distance, therefore we drew upon the literature in computer-mediated communication (CMC). Romiszowski (1997) defined CMC as an on-line organized interaction to bridge instructional gaps. CMC instructors are facilitators serving as coaches, setting activities, fostering productive discourse and refocusing unproductive pursuits. This learning environment sounds remarkably similar to PBL except that discussions happen asynchronously.

Canadian graduate students stated in surveys, interviews and focus groups that a sustained presence by the instructor was critical for students to remain active in the CMC learning experience (Fabro & Garrison, 1998). A ‘strong instructor presence’ sounds inconsistent with PBL philosophy. Yet, in an on-line environment if learners or instructors do not post messages, that is have a presence, it is as if they are not present or never came to the classroom. In the class, small group setting, non-verbal cues indicate what the facilitator is thinking. On-line, the instructor gives these cues through postings.

Our research objective was to assess teaching presence using an instrument developed for on-line courses or CMC. We selected a facilitator experienced with traditional PBL groups and with consistently high teaching evaluations. We followed this facilitator over five years as she incorporated on-line PBL into her teaching.

Theoretical framework

Garrison et al. (2000) developed a framework for analysing computer conferencing in on-line courses encompassing cognitive presence, teaching presence and social presence. To understand the success of on-line teaching each of these components must be considered.

In previous papers, we studied cognitive presence (Kamin et al., 2001; 2003). Our next step was to explore teaching presence. Anderson (2002) defined teaching presence as the design, facilitation and direction of cognitive processes for the purpose of identified learning outcomes. We applied Anderson’s teaching presence code for assessing an instructor’s teaching in an on-line environment (Anderson et al., 2001) to on-line PBL.

Methods

We used case study methodology to study a single PBL instructor in an on-line environment from 1998 to 2002. The instructor taught third year pediatric clerkship students.

Practice points

- Virtual PBL groups may require different strategies than in-person groups since facilitator messages are the only indication that the instructor is present in the group.
- Students need active guidance in faculty expectations in online PBL.
- Facilitators should be active in the asynchronous discussion groups, encouraging student discussion and prompting them to think deeper.
- Facilitators’ pattern of messages will fluctuate as they gain experience with new cases and build a relationship with a particular group of students.
These students had no previous PBL experience. The facilitator was a physician who had a year of experience conducting face-to-face PBL sessions with the cases in this study before starting virtual groups.

**PBL cases**

Four PBL cases were the foci of the PBL discussions. The PBL cases were presented in the virtual environment using a CD-ROM/web hybrid format (Kamin et al., 1999). In each PBL case, students watched digital video clips of history taking and saw physical examinations. Individual students electronically posted their hypotheses about what was happening with the patient. Then the student group (five to six students) asynchronously discussed issues to develop a more definite hypothesis. Each case was discussed during a one-week period.

**Teaching presence measures**

In face-to-face PBL groups, the tutor establishes a process and if successful, fades into the background facilitating collaboration among the students. However, keeping students engaged in a virtual environment requires a sustained instructor presence. We used the code developed by Anderson et al. (2001) to analyze on-line discussions. The code addressed three dimensions of presence: instructional design (ID), facilitative discussion (FD) and direct instruction (DI). ID included the managerial and organizational roles; FD was for the social roles and DI was for the pedagogical and intellectual roles. Each major dimension is the sum of four indicators of teacher presence. Table 1 summarizes the code.

**Procedure**

Each student group studied one or two PBL cases. We coded all PBL case discussions conducted by this one facilitator from December of 1998 to November 2002. We followed Anderson and colleagues’ protocol (2001) by defining the unit of analysis as each message submitted by the instructor. A maximum of three indicators of teaching presence was assigned to a message. Two coders coded nine PBL discussions in common. The average correlation between the raters for the scores for the three categories of ID, FD and DI was 0.8 or higher. The remaining discussions were divided between the two raters.

Initially only one PBL case was facilitated by this instructor during a clerkship rotation and subsequently two PBL cases were facilitated. For the first 44 PBL discussions, the same two PBL cases were used. After the 44th discussion, this instructor occasionally taught two new PBL cases. For data analysis, each PBL case was summarized to include: the name of the PBL case; the order in which it had been offered relative to the instructor’s first PBL case on-line (an indicator of experience); the order it was offered during the clerkship (first or second) and the individual indicator scores.

**Analysis**

We obtained descriptive information for the number of messages sent, the scores for each indicator type and for each teaching presence category. We examined the relationship between increasing facilitator experience and each of the three teaching presence category scores. We described the fit of the data as either linear or curvilinear and provided an estimate of $R^2$ (SPSS for Windows version 11.0). We descriptively compare teaching presence in a first PBL case to a second PBL case for the same group of students. (Figures and Table are shown at the journal’s website, www.medicalteacher.org.) The facilitator reviewed the results and indicated her concurrence on the interpretation of the findings.

**Results**

This instructor began conducting virtual PBL cases in December 1998. She had 32 groups of students and conducted 62 on-line sessions by November of 2002. ‘Nick’ was the first PBL case presented to the students 68.8% of the time. ‘Ali’ was the second PBL case presented in 73.3% of the rotations. Two other PBL cases, ‘Twins’ and ‘Jessica’, were used as either the first or second PBL case (but always with either ‘Nick’ or ‘Ali’) beginning in January 2002.

The typical PBL case had approximately 35 messages from the facilitator. Of the indicators, she most frequently addressed instructional design issues (23) followed by facilitative discourse (19) and direct instruction (19). See Table 1 on journal website, www.medicalteacher.org. For instructional design (ID), the relationship with experience was best fit by a cubic relationship ($R^2 = 0.30$, $p < 0.001$). The instructor increased the ID comments in her messages with each PBL discussion and then leveled off. The ID comments rose again as new PBL cases were introduced. The ID pattern was driven by the PBL case presented first for each group of clerkship students ($R = 0.50$). The ID teaching presence is nearly constant across all of the PBL cases taught second ($R^2 = 0.068$). Here is an example of entries coded in the ID category:

‘Hello everyone. I know this is a different form of learning. Don’t go crazy with your messages but participate. Reply to each other. Try to add to the conversation and take the learning deeper’ (ID—Designing Methods).

‘Don’t forget you need to submit orders before you can move forward in the case’ (ID—Netiquette).

For facilitating discourse (FD), the data were fit by a linear relationship ($R^2 = 0.13$; $p = 0.004$). Generally, FD increased with experience. This pattern is driven largely by the FD in the first PBL case ($R^2 = 0.16$). However, interestingly, the FD in the second PBL cases generally trended slightly higher as indicated by a higher intercept. An example in this category includes:

‘Have any of you taken care of kids with Down’s’ (FD—Drawing in participants).

‘You all did a good job for the first time you’ve seen a child with altered mental status’ (FD—Assessing the efficacy of the process).

For direct instruction (DI), linear, quadratic and cubic trends were significant and the quadratic fit ($R^2 = 0.24$, $p < 0.001$) was clearest to interpret for both the first and second PBL case. The DI for the first PBL case taught rose until the facilitator reached a level of comfort and declined over time. The second PBL case declined in DI over time, but rose when new second PBL cases were introduced into
the clerkships. Here is an example of direct instruction:

‘John has just told us the blood pressure is abnormally high. So what’s causing the HTN?’ (DI—Focusing the discussion).

‘Scott gave us one example and then John followed up nicely on meningeal signs in kids. Fluid status in kids is also very important as unlike adults, kids will maintain their blood pressure until the very end’ (DI—Summary).

The number of messages per PBL case also followed a quadratic fit ($R^2=0.24$, $p<0.001$) with the number of messages rising for the first PBL case and tapering off as the instructor became more experienced. The second PBL cases decreased in the number of messages sent by the facilitator with messages rising only as new cases were introduced into the clerkships.

**Discussion**

The instructor’s skill in questioning, responding to and assisting learners can have a large impact on the CMC learning experience (Berge, 1995; Harasim et al., 1996). One critical role that an instructor performs is to diagnose learners’ gaps in knowledge and guide them to a more mature understanding. If this does not happen, learners are likely to end up with very different understandings than what is intended by the objectives of the lesson (Lave and Wenger, 1991; Brooks et al., 1999; Bransford et al., 2000). This CMC philosophy is very consistent with PBL.

We applied an existing code for CMC to examine the teaching presence of one facilitator over a period of five years as she gained experience in an on-line PBL environment. Overall, we learned that the instructor needs to find a comfort level with on-line communication. In general, she had to build up to the right level and then taper off. We saw this when she first began to facilitate, but also when she begins PBL cases new to her. The instructor appeared to facilitate discussion better in a second PBL case than in the first leading us to believe that this element of teaching presence increases as the instructor gets to know the learners. The number of messages increased when PBL cases were new to the instructor as she seeks the right level of communication.

The teaching presence reached a level that remains relatively constant when using familiar PBL cases.

The indicators in the Instructional Design category are primarily concerned with establishing the process and expectations for the students. The instructor’s higher ID presence in the first PBL case than in the subsequent PBL cases makes sense. Once the students know what is expected, less time is needed to communicate process issues. The instructor initially sent too few messages to explain the process to the learners. Once she learned this lesson, her ID presence initially increased and then stabilized. ID rose when new PBL cases were introduced to the students. One would anticipate the ID would level out once again as the instructor found her comfort level with communicating the necessary ID for new PBL cases. While the ID should be essentially the same, nuances of engaging the students may differ with new cases.

The indicators in the Facilitating Discourse category gradually increased with time and experience. The second PBL case was higher than the first which could indicate either a difference in the PBL case’s ability to stimulate discussion, an increased interest in a new PBL case or the instructor’s increasing familiarity with the students. The latter explanation is most plausible based on the content of the messages; she could encourage and prod them more in the second PBL case once she had a sense of them as the individuals.

The third category, Direct Instruction, has a misleading label. This is not direct instruction as in a facilitator providing a lecture on the topic. The indicators include, among others, summarization, re-focusing students and providing feedback similar to a PBL facilitator’s role. However, there were times when the instructor made teaching points that fell into the ‘Present Content’ category.

There are variables unaccounted for in this study. During this time-period the instructor had personal and professional responsibilities that may have impacted the level of her presence in a particular group. Since this particular medical school does not use PBL in the first two years, students with a stronger PBL background may not need the same on-line presence by the facilitator.

In her review of the results, the facilitator felt the teaching presence code represented her PBL teaching strategies quite well. Our ability to interpret the results and her concurring comments suggest that the code is an appropriate approach to addressing teacher presence in on-line PBL. Since this is a study of a single instructor, this instructor does not represent a sample which can be used for generalization to a population.

In spite of its limitations, we feel we learned from this study about on-line PBL facilitation. We can provide general guidance to instructors, helping them find a comfort level with the amount of instruction and feedback needed. The code used in this study provides a useful framework to describe kinds of messages a facilitator can send and the purpose of such messages.

Faculty developers could use this code as a diagnostic instrument to compare the magnitude and pattern of teaching presence among instructors. With such information they could measure the effectiveness of faculty development activities. Researchers might use the code to compare content experts vs. non-experts in on-line.

We believe the facilitated group is a critical element of effective learning with cases and is an essential part of PBL. Our facilitator learned that she needed to increase her presence in the on-line discussion for students to feel that she was present in the group. Group discourse requires perspectives to be explained, evaluated and challenged (Garrison, 1993). To guide future research in this area, we sought to understand one effective facilitator’s presence over time and numerous groups.

**Notes on contributors**

**Carol S. Kamin** is the Director of the Project LIVE Consortium and an Associate Professor of Pediatrics at The University of Colorado School of Medicine. She is interested in how elements of PBL cases, including case modality, impact the discussion of the group as well as individual learning and professional development.

**Patricia O’Sullivan**, who is based at the University of California San Francisco, has collaborated with Dr Kamin to evaluate the use of video in PBL particularly as it facilitates clinical learning. She also is involved in applying design and statistical approaches to these problems.

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of Medicine. She co-director of the development team of Project LIVE and facilitates virtual groups in the Pediatric Clerkship.

**Monica Younger** is an instructor at The University of Colorado School of Medicine, and supports all aspects of Project LIVE, from video and audio production to gathering data for research studies, to supporting the users of the application.

**Ted Wade** is an Assistant Professor at National Jewish Medical and Research Center. He designed and implemented the software for case authoring and presentation in Project LIVE.

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**References**


