

# Developing Historical Thinking in PBL Class Supported With Synergistic Scaffolding

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**Abstract:** As PBL has gained popularity across disciplines, there is an increasing need to understand how to successfully implement PBL in a large classroom. In this study, we investigated how PBL was used to support development of historical thinking skills in a large university history class. Video analysis showed that the instructor interacted with both the students and representational tools to provide multiple synergistic supports during the PBL sessions.

Although Problem-based Learning (PBL) has been studied in a variety of contexts (e.g., Walker et al., 2015), PBL in large active learning classrooms has been less well studied. Adapting PBL for large classes requires a careful balance of PBL practices with the interactions in which PBL scaffolding is provided (Puntambekar, 2015). In PBL, instructors employ multiple forms of scaffolds to support collaborative learning and disciplinary problem-solving. These scaffolds include shared representational tools like structured whiteboards, but an instructor's timely and contingent support is a crucial scaffolding element; this is generally only possible in classrooms with a small instructor-to-student ratio (Puntambekar, 2015). Visual representations make student thinking visible to instructors in large classrooms, allowing quick access to the current state of students' inquiry process and making synergistic scaffolding possible. Our PBL intervention was situated in a large university history classroom, in which small groups of students arranged at oblong tables equipped with whiteboards and large computer monitors to serve as shared representational tools. The tables fostered collaboration in an open active learning space where instructors could wander and engage with the students. We focused on investigating interactions between the instructor and students as they used these representational tools in order to understand how PBL was appropriated among students in order to develop historical thinking skills, and how multiple forms of scaffolding function in a synergistic and contingent way to make PBL in this large learning space achievable for both instructor and students.

## Methods

This study was conducted with 93 undergraduate students in a large PBL history classroom at a public Midwestern University. Students were divided into 16 groups of 5-6 students in an active-learning classroom with oblong tables that promote small-group collaboration via shared table space and a large shared monitor. Five groups volunteered to participate in the research and were video-recorded during three 75-minute class sessions. Open space between tables facilitated a larger shared workspace by allowing the instructor and 2 teaching assistants to wander and observe the groups in between the instructor's mini lectures to the whole class. Students anchored their PBL in an ill-structured question about historical responses to bubonic plague, and each PBL encounter added iterative complexity to the question. The first question asked, "What *single* element was the most significant factor in the responses to plague in the 6<sup>th</sup> century Justinianic Plague?"; the second asked "What *two* elements interacted to explain responses to plague in the 14<sup>th</sup> century?"; the last question asked "What *single* element helps explain plague in three different outbreaks (6<sup>th</sup> century, 14<sup>th</sup> century and 20<sup>th</sup> century)." In the first two interventions, groups were required to organize their historical thinking via a structured collaborative PBL workspace divided into 4 quadrants. These quadrants integrated history-learning principles from the American Historical Association (AHA) together with the inquiry-oriented principles of PBL: "potential hypotheses", "what we know (evidence with citations)", "what we don't know", and "research agenda". In the third intervention, students were given an open-ended question and allowed to structure their own group collaboration.

Five groups were video recorded three times in the semester. We then narrowed our focus to three groups that were provided with different representational tools (either computers, whiteboards or iPads). Interaction Analysis (IA) was employed to observe the distributed and ongoing social processes which occur moment-to-moment during collaboration in order to gain insights into students' development of historical thinking skills and instructor provision of contingent scaffolding for students learning (Jordan & Henderson, 1995).

## Findings

Over the course of the three PBL sessions, students gradually began to appropriate the norms of PBL to refine their responses to, and marshal evidence for, increasingly complex questions. At the first PBL session, students

struggled with understanding PBL, with the ill-structured problem, and with finding appropriate evidence to support their hypotheses. For example, one student asked “What are we supposed to do?” on first encounter with the PBL task, and another student answered “5 minutes to be confused.” This conversation demonstrated that students struggled with the PBL process while also admitting that it was acceptable to be confused in the “messy” and complex PBL learning environment.

However, students gradually appropriated the PBL process to develop historical thinking skills over time with multiple forms of scaffolding functioning in a synergistic and contingent way. For example, at the second encounter of PBL session, the visual representations of PBL quadrants on whiteboard, computer and iPad exposed students’ reasoning process, allowing the instructor to assess the current status of the group’s inquiry process and give adjusted feedback in a more responsive and contingent manner. In particular, the PBL quadrant made students’ thinking immediately visible to the instructor without the instructor interrupting the discussion or making students repeat themselves. The instructor’s responses throughout the discussion drew on the students’ visual representation of their thinking to validate the students’ performance in the inquiry process to date. (i.e., instructor’s asking “Is there an element of, you guys had talked about medical response?” and suggesting “So, now you need to hunt down evidence and figure out how to go get more.”)

At the third encounter of the PBL session, students demonstrated that they had appropriated not only the underlying disciplinary norms that required them to synthesize three separate historical contexts into one argument but also the value of elaborating the argument in a shared PBL quadrant. More importantly, the instructor’s scaffolding was taken up by the students properly and was effective. For instance, the students appeared to regulate their argumentation process, as evidenced by the statement that they should clearly indicate the draft nature of their statement so the instructor “doesn’t come and say that doesn’t make sense.” Here, students acknowledged the fact that they would receive ongoing feedback based on what was written on the quadrant. The integration of PBL norms, instructor scaffolding, and representational tool allowed students to advance their reasoning but in a very cautious and mindful way (i.e., using “not complete” wording on the whiteboard). This kind of interaction demonstrated how the PBL quadrants supported both instructor evaluation of, and feedback, about student selection of the vocabulary that would best demonstrate their historical thinking skills, as well as the challenge inherent in student appropriation of historical norms. (i.e., student’s initial frustration “Oh, my god”)

## Discussion

This study illustrates how PBL, and particularly visual representations of students learning process, can support the development of historical thinking skills in large undergraduate classrooms in an active learning environment. By co-constructing the PBL quadrants, students in a history classroom were able to engage in an inquiry-oriented activity by generating multiple hypotheses to answer a central problem. This activity can be considered as *doing* history, which involves navigating multiple perspectives, evaluating the reliability of evidences the students built, and experiencing the nature of history which is interpretive and ill-structured (Monte-Sano, 2012). As the semester unfolded, student inquiry strategies evolved over time, in the later stages of the class, students demonstrated the ability to craft strong hypotheses, locate appropriate evidence to support these hypotheses and evaluate the validity of a hypothesis without the instructor’s explicit support. These learning processes were possible in a large PBL classroom because of the affordances of synergistic scaffolding. The representational tools common to PBL not only served as a communication channel to mediate student learning processes but also allowed the instructor to provide more contingent and efficient scaffolding without interrupting students. The instructor’s actions with the tools allowed her to successfully implement contingent scaffolding despite the generally perceived difficulty of doing so in a large classroom. Although more studies will be necessary in other disciplinary environments, we argue that this study effectively demonstrates the promise of PBL in a large history classroom, provided that care is taken to provide synergistic scaffolding that effectively integrates the instructor, students, and representational tools.

## References

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