Using Asynchronous Discussion to Promote Collaborative Problem Solving Among Preservice Teachers in Field Experiences: Lessons Learned from Implementation

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Abstract

Designers who are charged with creating online environments that support students' problem-solving efforts and instructors who are searching for instructional strategies to support students' asynchronous problem-solving efforts will find this paper useful. The paper describes a systematic approach for using computer-mediated bulletin boards to support collaborative problem solving among students in field experiences. This paper also briefly describes lessons that the author learned as he implemented the approach in a teacher education setting.

Introduction

The overall purpose of this paper is to share specific instructional strategies and assignment guidelines that promote the sound use of computer-mediated bulletin boards (CMBBs) to facilitate collaborative problem solving among students who are engaged in field experiences. To reach this overall purpose, the paper will proceed in three parts: First, theoretical connections among the purposes of field experiences, the methodology of problem-based learning (PBL) and the sound educational use of CMBBs will be made. Second, a format for a CMBB discussion that is congruent with these theoretical connections will be offered. Emphasized within this format will be specifics from the assignment guidelines that serve as instructional strategies to help students maximize the educational potential of the discussion. Third, I offer "lessons learned" from one implementation of this approach. Inherent to this description of implementation will be design and pedagogical advice for others who may attempt to employ the approach that I describe; also, within the "lessons learned," suggestions for future research will be made.

Theoretical Connections among Field Experiences, PBL, and CMBB Discussion

Discussion via CMBBs can support field experiences (Doering, Johnson, & Dexter, 2003); CMBBs also can support certain types of problem solving (Uribe, Klein, & Sullivan, 2003; Jonassen, 2002; Jonassen & Kwon, 2001). Beckett and Grant (2003) have made cursory connections *among* CMBBs, PBL, and field experiences. Scarce—though not non-existent (cf., Knowlton, 2004)—within the literature are firm theoretical connections among all three. The argument for supporting all three is based on two premises:

Premise #1: Students must solve problems to be successful in field experiences.

Premise #2: CMBBs are an efficient tool for solving many types of problems.

If these two premises are true (and each will be discussed briefly below), then a conclusion follows: CMBB discussions may be useful as a tool for solving problems that students encounter as they participate in field experiences.

Solving Problems as Success in Field Experiences

When students move from classroom settings to field settings, they will experience a shift in what it means "to learn." In classrooms, learning is often the result of memorizing and regurgitating a database of information. Even when professors try to incorporate problem solving into classrooms, those efforts are often inferior because the problems are well-structured and little—if any—real utility exists in solving those problems.

In field experience settings, though, the success of the student, who has now been recast as human capital, depends on that student's ability to solve real problems that are often ill-structured. These problem-solving efforts become the very definition of learning within field experiences; thus, students must solve problems if a field experience is to result in learning. This view is consistent with Jonassen (2002) who notes differences between classroom learning and learning in the "real world." The learning results

from the confluence of, on the one hand, the variety, frequency, and complexity of the problems and, on the other hand, the high "stakes" of not adequately solving the problem.

CMBBs as Tool for Efficient Problem-Solving

Jonassen's (2002; 2003) point that not all online learning environments lend themselves to all forms of problem solving is clear. Still, CMBB discussion among students is a useful strategy for analyzing and solving many types of problems.

CMBB discussion, for example, can support many problem-solving processes through "writing to learn" (cf., Lindeman, 1995). As students represent problems in written form—a process advocated within many problem-solving models (e.g., Abel, 2003; Jonassen, 2003)—they are making the problem concrete, turning the ineffable into that which is effable. "Seeing" their problem and their own ideas about their problem can better help students develop a useful perspective on the problem.

Beyond the "writing to learn" standpoint, CMBB discussion increases opportunities for social learning and collaborative thinking—for cognition to be distributed across a community of learners who are engaged in field experiences but in different contexts. Students in field experiences are estranged as a result of both distance and time. In isolation, these students are situated in a specific context, but particularly for students who are accustomed to traditional classrooms, the estrangement can be disconcerting. When students are embedded within a specific situation or context, their thinking becomes both bound by and free within that context—their cognition is situated. Students recognize themselves as situated because they accept "the mutual relation of content and context, of individual and environment, and of knowing and doing" (Barab, MaKinster, Moore, Cunningham, & the ILF Design Team, 2001, p. 73).

Perhaps there are varying degrees of being bound within a context as one's participation moves from the periphery of that context to the center of meaningful activity (cf., Lave & Wenger, 1991) and as one comes to understand the fluid and iterative relationship between plans and actions (cf., Suchman, 1987). This is true for students in field experiences. While such situatedness is a benefit to students because it gets them beyond the walls of an artificial classroom, it also is a hindrance because some of the benefits of classrooms—discussion and collaboration among students, for example—are lost. In short, students in field experiences can benefit from thinking within a context, but they need to participate in a type of distributed cognition in order to fully appreciate the uniqueness of their situation. Discussion through CMBBs can support this shift from situated to distributed cognition.

CMBB Strategies and Guidelines for Enhancing Field-Based Problem Solving

I have noted that students must learn to solve problems in order to be successful in field experiences. I have further noted that CMBBs can be a useful medium for problem-solving in field experiences but only if the use of the CMBB supports students as they transition from "writing to learn" (representing the problem for themselves) to thinking within an online community (experiencing distributed cognition). A CMBB discussion assignment must be designed to support this transition.

Slightly less lofty, yea though just as important, a CMBB discussion assignment must help professors maintain a delicate pedagogical balance: Professors must not usurp students' authority by solving the problems for them, or even providing a close-ended structure that leads students to a finite range of solutions (Beckett & Grant, 2003); yet professors must provide enough scaffolding so that students must—as described above—make their problems concrete and engage in social interaction as a means of solving the problem. In this section, assignment guidelines are offered that can help professors maintain this balance. These guidelines are offered not as a rigid approach to be denotatively followed, and professors might find that some deviation from the suggestions here will be useful in implementation.

The assignment guidelines are similar to those already existing in the literature (cf., Knowlton, 2002). Participants should be divided into two groups and discussion should be conceptualized as three-week cycles of sharing and response. At the end of each cycle, roles should be reversed so that group one participants perform the responsibilities of the participants in group two and vice versa. As it is not the medium of delivery that creates learning (Clark, 1983, 1994; Morrison, 1994), an emphasis on instructional strategies is emphasized (cf., Morrison & Guenther, 2000) within an explanation of each week of the discussion cycle. Notably, though, professors can provide resources that help participants across all weeks of the discussion. For example, professors might offer general guidelines for making CMBB discussion useful (cf., www.siue.edu/~dknowlt/DiscussContributes.htm).

Week One of the Discussion Cycle

Writing to learn and problem identification are the two areas being emphasized within week one. Participants assigned to group one are responsible for describing a "problem" that they are experiencing within their field experience. Following the guidelines for a "critical incident analysis" (Brookfield, 1987, p. 49), participants might be required to include numerous elements within their problem description. Professors can guide participants toward including of these elements by providing guiding questions as the basis of a week one contribution:

- When and where did the incident occur?
- Who was involved? (This should be phrased as roles—e.g., "my manager" or "a customer"—rather than names.)
- What was it about the incident that made it problematic?

The strategy of a critical incident questionnaire obligates discussion participants to organize the problem for themselves, which may result in increased clarity of the problem definition and its scope. This general approach is more likely to help participants better move toward productive solutions (Bruer, 1993).

One strategy that may be useful is to specify the type of problem that is worthy of being considered within the discussion. Within the context of a corporate internship, for example, problems might come in the form of those that are *interpersonal* (e.g., a conflict with a co-worker); *ethical* (e.g., questionable accounts receivable practices within an accounting department); or *managerial* (e.g., a lack of support from middle management to adequately solve a problem). Initially, it is useful to give students broad reign over the types or problems worthy of discussion, but if a certain category of problem monopolizes discussions, professors might specify types of problems that should be given priority as students decide what problems to share.

Week Two of the Discussion Cycle

Participants in group two are responsible for representing the problem through both retelling and elaboration. See Mayer (2002) for a discussion of the value of restating a problem and Johnsey, Morrison, and Ross (1992) as well as Jonassen (1998) for a discussion of the role of elaboration as an instructional strategy. The type of representing that I describe is a framing of the problem using both practical experiences and course theory. In terms of practical experiences, certainly expert problem solvers tend to relate current problems to other problems that are analogous in one way or another (Lakoff & Johnson, 1980). Therefore, there is value in when a participant responds to a problem by sharing a parallel or similar problem from another context.

Participants should also be required to help frame the problem using resources beyond their own experiences, though. Such resources will help those in field experiences connect their problems back to the type of textbook theory that they studied prior to their field experience. This type of connection is supported by Beckett and Grant (2003). Through indexes and tables of content, textbooks become a learning-on-demand resource, where participants self-select readings that would most likely contribute to an analysis of the problem-at-hand. In essence, this approach is indicative of the "classic version" of PBL (Hmelo & Evensen, 2000), which requires students to collaboratively "formulate learning issues by determining factors that may contribute to the cause or solution of a problem" (Knowlton, 2003, p. 5).

Week Three of the Discussion Cycle

More practically, all participants in both groups one and two should be responsible for three contributions to the CMBB discussion during week three of the cycle. Importantly, assignment guidelines should specify that week three contributions should be replies to week two contributions, not replies to the original problem discussed during week one of each cycle. This criterion, while initially may seem overly bureaucratic, is designed to create interaction among the participants within the CMBB discussion and promote a deeper analysis of the issues embedded within the problems, not just continued (and often redundant) "solutions" to the original problem. Pena-Shaff, Martin, and Gay (2001) determined that most participants "read and constructed their comments based on other participants' messages. However, [they] were unable to find explicit collaboration [among CMBB discussion] participants" (p. 54). By delineating some sequence to the discussion (i.e., insisting that week three contributions respond to week two contributions), the present approach is more likely to move participant collaboration toward a broader understanding of the problem, and thus more solutions.

The assignment guidelines that participants are given should clearly specify the purpose of week three contributions—to "further define the problem-at-hand through dialogue" by "reading what [others had written] within a 'thread' of discussion and interact by responding to [each other's] ideas." The wording of these instructions shifts the emphasis from cognition to distributed cognition. Such a shift would lead the "the unit of analysis" for understanding knowledge construction from "the individual's cognitive system" to "the interrelatedness of a diversity of intellectual systems" (DeHaan, 2002, p. 33). The wording used is equally important to the extent that it helps participants understand their responsibilities to other participants.

To scaffold students' abilities to offer week three contributions that do move the conversation forward and toward the type of interrelatedness that I describe, professors might offer a list of discussion prompts that participants might use as the basis of their week three contributions. These discussion prompts are often similar to the following items:

- Pick two replies to the same problem and discuss why you think one would work better than the other.
- Pick a reply to a problem and discuss the strengths and weaknesses of the proposed solution
- Pick a theory that someone mentioned as a help to understanding week #2 and apply that theory differently (or more thoroughly).
- Discuss your experiences with how a solution has/has not worked in the classroom.
- Write a summary of responses to your own problem and describe what the biggest things that you are taking away from your problem are.

Notably, I urge participants not to feel bound by these prompts, but such prompts can serve as a basis for helping participants see approaches for using week three contributions constructively.

Lessons Learned from Implementation

The approach and advice for implementing CMBB that was presented in the previous section of this paper seems to meet the goals of problem solving in field experiences. Across each week specific strategies are used to promote movement towards a better understanding of select problems. I have implemented this approach in the context of a two-year, field-based teacher-certification program that was designed to prepare undergraduate students (N=60) for careers as public school teachers. These preservice teachers were assigned to K-12 classrooms in partnership schools. During the first year of the two-year program, the preservice teachers often served as a teacher's assistant, paraprofessional, or aide. During the second year, though, the preservice teachers' became more centrally involved in teaching and learning activity. In this section, I describe lessons that I learned through this implementation. Inherent to these lessons is additional advice to others who may wish to use the approach presented in this paper.

Lesson #1: Shaping Discussion around Problem Solving Processes is Not Enough

As can be seen from the discussion of each week within the cycle, the assignment is shaped around notions of good problem solving. For example, neither weeks one nor two seem to emphasize solutions. Rather, they emphasize students' carefully defining the problem and raising learning issues—an emphasis consistent with many models of problem-solving (Knowlton, 2003), including, for example, the classic version of problem solving (Hmelo & Evensen, 2000). Perhaps instructional strategies that aim students toward habits of good problem solving are not enough. The preservice teachers in my implementation, for example, didn't seem to be aware that each week was following a problem-solving model. Rather, the participants were denotatively following instructions within the assignment guidelines. So, were students engaging in problem definition and representation as purposeful activity that served as a precursor to developing collaborative solutions? Or, were students simply fulfilling an assignment?

Certainly, participants' motivation is one factor that determines their willingness to engage in meaningful problem solving. But professors might help students understand the ways in which the approach presented in this paper does guide them through the problem solving process. Through such efforts on the professor's part, students may come to realize that participation in CMBB discussion is not "busy work" and does have an educational intent. As a result, students would be more equipped to not only participate in discussion but also to reflect on their participation and think metacognitively about their discussion participation.

Lesson #2: Balancing Issues of Breadth and Depth can be Problematic

My experiences with implementation suggest that the approach presented in the previous section of this paper does a good job of guiding participants toward defining the problem and developing related issues that may influence the problem or the solution. This type of depth is useful and supported as a hallmark of problem-based learning (Hung, Bailey, & Jonassen, 2003). However, I struggle with two seemingly contradictory elements regarding the issue of breadth versus depth.

Is there too much breadth? During week two of the cycle, participants delineated and discussed related issues, theories, and analogous problems as a tool for helping to shape the problem that had been presented in week one. In all honesty, I often struggled to see the connections between the issues raised in week two and the problem-at-hand. For example, it would not be uncommon for the problem offered during week one to be related to a learning issue (e.g., many students didn't meet the objectives in a lesson plan). But then, during week two, discussion dealt with cultural or economic reasons that parents were not actively involved as students completed homework. Certainly, a lack of parent involvement and classroom management can negatively affect the efficacy of a lesson, but are these issues the most salient given the problem-at-hand? Because I was sometimes torn as to the relevance of week two "issues" that were raised, I was tempted to offer more scaffolding to narrow the range of issues that were relevant. Doing that without undermining the very types of student authority and initiative that I was trying to build, though, is difficult. Development research might focus on the impact of such scaffolding.

Does the approach described in this paper allow for enough depth? My experiences suggested that because the preservice teachers spent two weeks defining the problem (week one of the cycle) and bringing up related issues both from textbooks and their experiences (week two of the cycle), there was difficulty during week three in coming to "solutions." Often during week three the preservice teachers simply offered more analysis of the problem and its scope. I attempted to overcome this problem by assigning a related—but different—assignment where the student summarized the discussion that resulted from his/her problem and created a solution that she/he planned on implementing.

Lesson #3: Balancing Facilitating with Grading is Difficult

Educationally useful is the idea of professors facilitating and managing CMBB discussions to help students maximize their own educational benefit. This educationally-useful activity sometimes becomes secondary to the administrative realities of grading. In the implementation that I reflect on in this paper, I became bogged down in grading, rather than facilitating the conversation in ways that would have been educationally useful toward the preservice teachers' continued good thinking and problem-solving habits. In fact, I find myself wondering if a stronger shift towards facilitating would have helped overcome the problems that I identified in "Lessons" one and two as described above.

Professors might overcome this problem by shaping assessments so that peer and self-assessment help students make judgments about their own contributions (and even determine grades). Self- and peer-assessments can come in forms as simple as dichotomous or Likert-scale checklists, but they also might involve processes indicative of a more careful analysis of students' contributions, such as qualitative and open-ended assessments. The emphasis on peer and self-assessment would "free up" the professor to guide and lead the discussion. The problem with this advice, of course, is that grades based on student assessments will possibly be inflated or will not be an accurate measure of student performance within the discussion.

Another way to overcome this problem of grading working against meaningful guidance might be to use a form on which students self-report their participation at the end of each three-week cycle. For example, the form might ask students to list the subject line of the threads in which they participated. The form also might ask students to briefly list the resources that they used in theoretically framing a problem to which they were responding. This form, then, would not be a self-assessment as much as it would be a productivity report. However, when students submit their form, the professor will have a list of threads in which to find their contributions. This might make the process of "grading" less time consuming.

Conclusions

While the implementation that I describe is within a teacher education setting, the strategies and scaffolding that I describe in this paper are not bound by content or discipline; instructors across disciplines who supervise field experiences might find the approach to discussion that is described in this paper to be useful for facilitating strong discussion. Importantly, the literature used to support this approach is a synthesis of literature from each "area" discussed here—i.e., PBL, bulletin board discussion, and field experiences. It is hoped that readers find this synthesis of ideas pedagogically useful.

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