The Interplay between Self-Directed Learning and Social Interactions: Collaborative Knowledge Building in Online Problem-Based Discussions

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Abstract: This paper illustrates collaborative knowledge building through problem-based learning (PBL) in online threaded discussions. PBL has been one of the most popular instructional approaches in health education. However, few qualitative studies described the essential aspects of the PBL learning processes, such as self-directed learning, and its impact on the building of professional knowledge. Therefore, this study illuminates students' ability to select, evaluate and make use of learning resources, a form of self-directed learning, embedded in a social context. This study aimed to 1) reveal different kinds of resources acquired and presented by students during discussions and to 2) describe patterns of knowledge building that emerged from integration of the above learning resources and consequently led to professional knowledge building. Using qualitative research methods, I analyzed 751 text messages from a distance learning class. The results revealed seven kinds of commonly used resources in the discussion. Results also show knowledge building occurred through the process of 1) enriching conceptual understanding, 2) connecting textbook information and personal experiences, and 3) comparing theories and practical approaches.

Introduction

This paper is part of a larger study investigating social interactions in problem-based learning. Over the past two decades, problem-based learning has been one of the most popular instructional approaches that has challenged traditional lecture-based learning in professional health education (Barrows, 1998). However, few qualitative studies have been conducted to describe the actual learning and report the impact of the PBL learning processes, such as self-directed learning on the building of professional knowledge. Researchers have little knowledge about how *human resources* are used and why, and which aspects of the social interactions in PBL affect learning (Blumberg, 2000; Hmelo & Evensen, 2000)**.** In order to gain insights into the collaborative learning process in PBL**,** this study investigates the interplay between self-directed learning and group discussions emphasizing the students' ability to make use of learning resources in a social context. This study aimed to 1) reveal different kinds of resources explored and presented by students during discussions and to 2) describe patterns of knowledge building that emerged from integration of the above learning resources. I posed the following two research questions:

1.) What kinds of learning resources are presented during the online discussions?
2.) How does the group build professional knowledge collaboratively by using different learning resources?

I chose the term *knowledge building* to foreground my observation that obtaining professional knowledge requires students to integrate meanings and relationships among information and to search and evaluate information. The depth and range of knowledge built together depends on how much students explored in multiple resources and the extent students reflected on the content in the messages.

Online Learning Activities

This study was conducted on a graduate level, distance learning class designed for students in a nurse-midwifery program. Students in the class spent 7 weeks studying off-campus without face-to-face class meetings. Online asynchronous discussions were the major learning approach during off-campus study. The online discussions took place in a text-based, message board environment created by the university. The message board allows its user to either start a new thread or respond to a previous message. Students can also share resources by attaching files to the messages. Three pedogogical approaches of problem-based learning were adopted in online discussions: 1)

using a puzzling or problemtic situation as the starting point for learning, 2) encouraging student-centered learing and self-directed learning, and 3) utilizing small group discussions (Barrows, 1998).

Each week, a problem was posted by the faculty to focus on a selected health-care topic. The instructors prepared a situation requiring improvement or a general scenario requiring attention from the midwives in prenatal care. Associated with the situation or scenario, several questions were listed to invite solutions or recommendations. Questions were written in a general and open-ended manner. Students were also provided with supporting reading materials. I present below a sample question:

> **Anemia in Pregnancy**
> Sherrie, 20 year-old, G1P0 (one pregnancy, no deliveries), Euro-American is in for her initial OB visit at 12 weeks. Your "spun Hct" is 34% (in your practice, you commonly order Complete Blood Count only if risk factors exist for anemia).
> - Would you do further lab studies? If so, which? If not, why not?
> - How would you counsel Sherrie regarding nutrition?
> - Would you give Sherrie iron supplementation? Why or why not?

Students were asked not only to articulate their plans for patient care, but also to include evidence from their readings to support their decision making. Each student was responsible for posting three kinds of messages for each online discussion: 1) one initial response to each question, 2) responses to other messages, and 3) a summary for the week. After posting their initial message, students were required to read and reflect on each other's messages.

Data Collection and Data Analysis

To address my research questions, I adopted a naturalistic research approach (Moschkovich & Brenner, 2000) and qualitative research methods. Seven hundred and fifty one messages from 85 threads were analyzed. Twelve students and two instructors participated in the online discussions. Data collected for this study also includes student interviews and a teacher interview. To enhance the trustworthiness of the analysis, I triangulated findings from discussions with interview data.

Both content analysis and discourse analysis were conducted to reveal patterns in the asynchronous discussions. I am interested in not only what had been generated as artifacts during the asynchronous discussion, but more importantly, how the discussions evolved and resulted in explorations of professional knowledge. The first level of analysis involves coding different kinds of learning resources being incorporated into the discussion and counting their frequencies. Seven different kinds of learning resources grouped into three major categories: 1) assigned materials, such as lecture notes, publications assigned in the reading list; 2) experiences, such as professional experiences, personal experiences, and stories (from friends, families or heard from the news); and 3) information found by students, such as journals, additional textbooks, and other information gathered through phone calls or internet searches.

The second level of analysis examined connections built among these messages. I emphasized the interactions between online messages by viewing online discussion as text connection practices. The *intertextual* links were interpreted from thematic relationships of how the information in these messages related to information in other message (Bloome, 1993). Intertextual links are categorized as 1) extending ideas, 2) alternating ideas, 3) reflection, 4) posing questions, and 5) summarizing ideas. Each category contains several subcategories of coding keys. After identifying learning resources and connections between messages, I searched patterns of collaborative knowledge building. Different patterns were identified by the kinds of learning resources included as well as by how each text was justified in relation to previous texts (types of intertextual links). Three different patterns emerged from the analyses.

Learning Resources Presented in the Discussions

Figure 1 shows the percentage of resources used, grouped by their origins. It is shown that 44% of the resources are experiences (i.e., personal experiences, professional experience, and stories), 29% of the resources are acquired by students through their own searching (i.e., journal papers, additional textbooks, or online information), and 27% of the resources are suggested by faculty (i.e., lecture notes and publications in the reading list). The results show that students were able to make use of information from assigned reading materials and, more importantly, were able to search for new resources outside of the class during online discussions. The later finding is

a notable outcome of self-directed learning. This result suggests the students' ability to independently search learning materials when needed and to evaluate the appropriateness of those newly found materials for learning.

Besides academic publications, both professional and personal experiences were alternative substantial learning resources. Figure 2 illustrates the dominating number of professional experiences shared during online discussions. Sharing information gained from prior work-related experiences and gained from current clinical practicum were highly valued by students during online discussions. Some students were registered nurses and some had some midwifery experiences before attending this graduate program. Each student gained professional experiences through participating and observing clinical practices during the weekly visit to a clinical site. Students expressed during the interview that knowing what other classmates were experiencing on their own was an important aspect of learning.

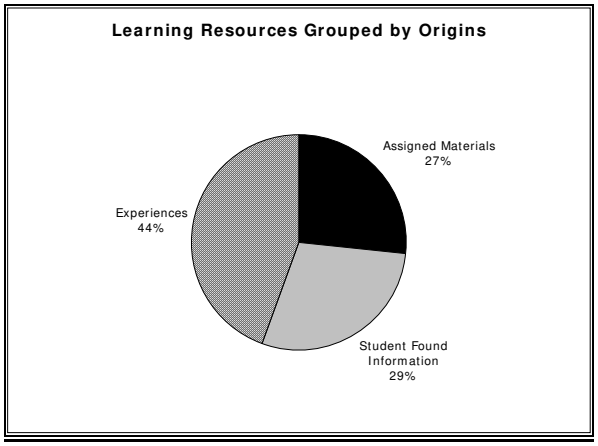

Figure 1. Learning resources grouped by their origins.

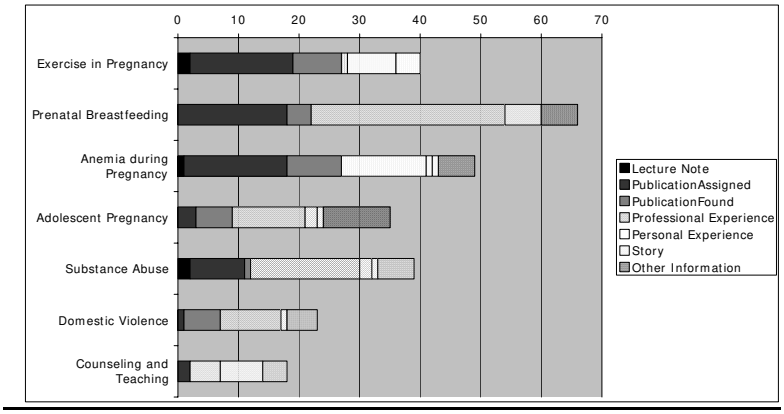

Figure 2. Usage of learning resources displayed by week.

Patterns of Collaborative Knowledge Building

Three major patterns of knowledge building were revealed in the data. The essence of these processes is the continuous tailoring of knowledge gained from various sources both from retrieving prior knowledge and experiences and from acquiring new information from purposeful searches in academic publications and from the Internet. The process of collaborative knowledge building takes advantage of the diverse levels of existing expertise among students as well as individual's self-directed learning skills that bring in new information to the discussions.

Because self-directed learning is the center of the analyses, all three patterns started with information from nursing literature and then expanded into other resources. Table 1 summarizes the major intertextual links and kinds of learning resources in the three patterns of knowledge building. The first pattern only involves information in publications. Students connected different information in publications through discussions. In the second pattern,

students gained insights into theoretical perspectives when other students introducing personal experiences of pregnancy. The third and the most complicated pattern is that students confirmed or disconfirmed information in textbooks or other publications by comparing it to experiences in the actual practices. In the following, I introduce the three patterns of collaborative knowledge building with a representative case selected for each.

Table 1. Characteristics of different patterns of knowledge building.

Patterns of knowledge building	Intertextual links involved	Learning resources used
Enriching conceptual understanding	• Agreement with new information • Refinement of ideas	• Lecture notes • Publication assigned • Publication found
Connecting textbook information and personal experiences	• Agreement with new information • Refinement of ideas • Reflection on experiences • Reflection on professional roles and practices	• Publication assigned • Publication found • Personal Experiences • Stories
Comparing Theoretical Perspectives and Practical Approaches	• Agreement with new information • Disagreement with new information • Refinement of ideas or suggestion for alternative ideas • Reflection on experiences • Reflection on professional roles and practices • Reflection on learning	• Publication assigned • Publication found • Professional experiences

1. Enriching Conceptual Understanding

The first pattern of knowledge exploration refers to a process wherein students enrich conceptual understanding collaboratively. This pattern is characterized by rich information drawn from academic publications for the support of a single issue. During the discussion, it was very common for students to collaboratively explore information from multiple nursing literature sources. One student's presentation of information from the literature invoked other participants to further perform self-directed learning – searching for supporting information from other academic publications. As a result, those correlating messages did not only strengthen the argument by the quantity of repetitive postings regarding the same topic, but also elaborated the argument with new information.

In an example (see Figure 3), various pieces of information cited from textbooks and research articles were presented together to enrich the understanding of the central concept about the impact of strenuous work activities during pregnancy. Four students who took part in this discussion agreed on the same point of view that some job activities may cause negative effects on a pregnant woman. This perspective was confirmed through different sources and enriched with additional details. Each text was posted in agreement with information in previous texts and further nurtured through the discussion.

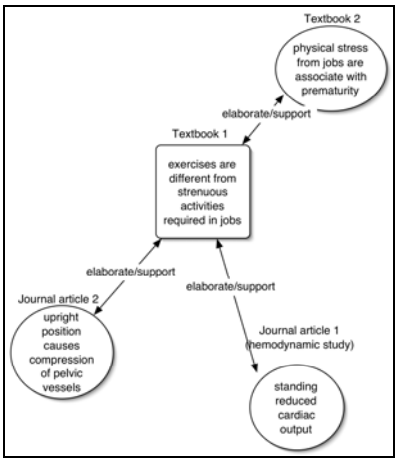

Figure 3. Example of enriching conceptual understanding.

Although this discussion did not involve any clinical examples, robust theoretical knowledge is essential for students' future practices. Through collective efforts of self-directed learning, students gathered theoretical perspectives regarding a substantive issue shown in multiple research publications.

2. Connecting Textbook Information and Personal Experiences

A second pattern of collaborative knowledge building involves the connection of textbook information and personal experiences. In a social context, students made connections between the theoretical perspectives shown in nursing literature and the health-care situations that they experienced in person. Those experiences provided testimonials for a particular issue regarding health-care management or treatment. The following example illustrates how personal experiences elaborated results of self-directed learning.

In an example (see Figure 4), a student shared her own experiences during pregnancy to support the significance of exercise stated in a textbook. This instance of knowledge building started with a statement of the benefits of exercise. During the discussion, this student switched her identity from a health-care provider to a health-care receiver (a pregnant women) and stated the benefits of exercise from a first-person point of view. Her personal story provided her colleagues with insights into pregnancy and confirmed the theoretical statements drawn from textbooks. As stated in the interview, her personal experience with giving birth to four children contributed to her midwifery knowledge. For students who have not experienced pregnancy, the opportunity to hear about these personal stories may be particularly valuable. Other students expressed on many occasions during the discussion their needs to learn from others' experiences.

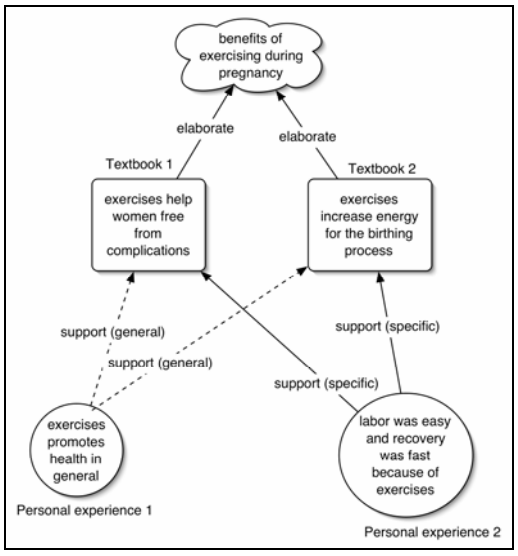

Figure 4. Example of connecting textbook and personal experiences.

3. Comparing Theoretical Perspectives and Practical Approaches

A final pattern of collaborative knowledge building involves the comparison of theoretical perspectives and practical approaches observed at clinical sites. Students explored the relationships between nursing guidelines found in different resources as well as the relationships between nursing guidelines and clinical implementations. In online discussions, students had a chance to explore the complex relationships between nursing guidelines and clinical approaches undertaken at the clinical sites. This example demonstrates multiple comparisons between theoretical guidelines and actual practices (see Figure 5). The discussion started with an attempt to explore the suggested hematocratics (Hct) levels for assessing anemia. Students found inconsistencies between different textbooks (i.e., Youngkin's, Beard's and other readings), as well as between textbook information and clinical practices. In the first part of the case, students and faculty reflected on actual approaches used in clinical sites when discovering that two guidelines were inconsistent. Later in the same thread of discussion, a student argued that theoretical perspectives found in a textbook disagreed with a clinical decision made by health care professionals at a clinical site.

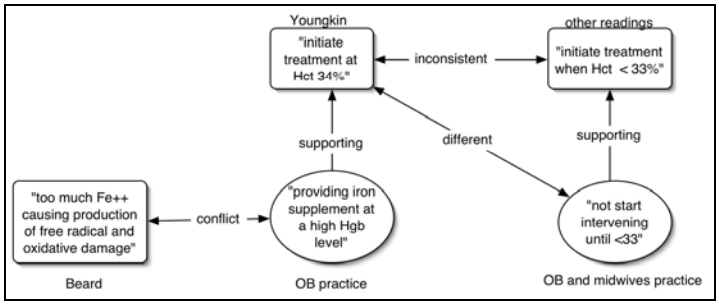

Figure 5. Example of comparing theoretical perspectives and practical approaches.

Ideally, before making clinical decisions, health-care providers should consult guidelines in publications and evidence from the latest research publications. However, guidance from textbooks and research results is decontextualized from the complex clinical situations. Information from multiple sources may suggest slightly different standards for dealing with the same situation. Applying knowledge in clinical practice requires students to accommodate textbook information in relation to actual situations to develop knowledge-in-use. Therefore, sometimes, textbook information is not necessarily the perfect guideline. As one student stated in her interview, it was difficult for her to learn medical, hard-science content like anemia treatments and evaluation. She said, "The results from different research might be contradictory and doesn't match the situations in the clinic. It's hard to pull out, to know what I should take away from this."

By posting conceptual information and clinical situations together in one discussion, students and faculty created the opportunity to examine the consistency (or reveal the inconsistency) of information acquired from different resources. One student's reflection on the discussion provides the evidence for the significance of this kind of knowledge exploration. She commented on the discussion, "As students, I think so often we just accept the current practice as the *right way*. Good job trying to look *beyond* the way its always been done to an evidence-based practice." Moreover, by collecting and accommodating both theoretical and practical information, students may avoid over reliance on either textbook guidelines or conventions of practice. In order to stay current in their practices, students need to be aware of the discrepancy and be able to think critically and clinically.

Conclusions and Discussion

Research in the past judged the effectiveness of online discussion by the length of the threads and the duration of sustaining topics (e.g., Guzdial & Turns, 2000). Nonetheless, the above findings suggest considering what students have accomplished through bringing in new information and through making connections between pieces of information. Students searched and retrieved information from different learning sources and accommodated new pieces of information into their on-going discussion. With attention to the detailed information of the online interactions, researchers can understand what actually happened during PBL and develop further approaches to promote self-directed learning with the best use of social environments.

The collaborative knowledge building process valued self-directed learning skills adopted by individuals to search for information and also valued critical judgment of existing messages. In responding to new information, students declared acknowledgement, showed agreements or disagreements, and elaborated ideas. As an iterative process of knowledge building and information searching, knowledge exploration provided opportunities for the group to enhance professional knowledge. The group had a chance to collect theoretical perspectives distributed in different kinds of academic publications. When more than one kind of information was introduced in the discussions, students made the connections between theoretical perspectives and personal experiences as well as between medical guidelines and actual clinical approaches. Students also had a chance to develop a more thorough image of actual midwife practices with information from various clinical sites presented by their colleagues. As a group, students examined the congruency and the inconsistency between information through self-directed learning and by incorporating real life experiences.

As Brookfield and Preskill (1999) asserted: "Discussion is a powerful educational tool to help students develop an awareness of and appreciation for the multiplicity of views and perspectives that reflect the complexity of human experiences." In online discussions, I witnessed the multiplicities of views and perspectives. In this learning community, individuals were committed to sharing information for the purpose of building understanding in all participants. In Scardamalia & Bereiter's (1994) story of the copy machine repairperson, information sharing within the community improved every repairperson's ability to fix copiers. Shown in this study, the overall knowledge in the community improved when results of self-directed learning were shared among members and when the members commented on the information.

The interplay between self-directed learning and group interactions, resulted from the search and integration of multiple learning resources, also helps students to adapt to professional nursing roles. Wong et al (1995) concluded that nursing students who adopt multidimensional perspectives and search for alternative resources tend to be more courageous and open-minded. The skills of critically judging the appropriateness of information and the attitudes towards searching for alternative perspectives are essential for the ongoing learning processes in an era when nurses face unprecedented social, technical, and professional change (Brown, Mattew-Maich, & Royle, 2001). As shown in this study, online message board provides the environment for students to be apt at these skills.

References

Barrows, H. S. (1998). The essentials of problem-based learning. Journal of Dental Education, 62(9), 630-633.

Bloome, D., & Egan-Robertson, A. (1993). The social construction of intertextuality in classroom reading and writing lessons. International Reading Association, 28(4), 305-333.

Blumberg, P. (2000). Evaluating the evidence that problem-based learners are self-directed learners: A review of the literature. In D. H. Evensen & C. E. Hmelo (Eds.), Problem-Based Learning: A Research Perspective on Learning Interactions (pp. 199-226). Mahwah, NJ: Lawrence Erlbaum Associates.

Brookfield, S., & Preskill, S. (1999). Discussion as a way of teaching: Tools and techniques for democratic classrooms. San Francisco: Jossey-Bass.

Brown, B., Mattew-Maich, N., & Royle, J. (2001). Fostering reflection and reflective practice. In E. Rideout (Ed.), Trsnforming Nursing Education Through Problem-Based Learning. Mississauga, ON: Jones and Barlett Publisher Canada.

Guzdial, M., & Turns, J. (2000). Effective discussion through a computer-mediated anchored forum. The Journal of the Learning Sciences, 9(4), 437-469.

Hmelo, C. E., & Evensen, D. H. (2000). Problem-based learning: Gaining insights on learning interactions through multiple methods of inquiry. In D. H. Evensen & C. E. Hmelo (Eds.), Problem-based learning: A research perspective on learning interactions (pp. 1-16). Mahwah, N. J.: Lawrence Erlbaum Associates.

Moschkovich, J. N., & Brenner, M. E. (2000). Integrating a naturalistic paradigm into research on mathematics and science cognition and learning. In Handbook of research design in mathematics and science education. Mahwah, NJ: Lawrence Erlbaum Associates.

Scardamalia, M., & Bereiter, C. (1994). Computer support for knowledge-building communities. Journal of the Learning Sceinces, 3(3), 265-283.

Wong, F. K. Y., Kember, D., Chung, L. Y. F., & Yan, L. (1995). Assessing the level of student refelction from reflective journals. Journal of Advanced Nursing, 22, 48-57.