

Dimensions of Social Interactions Contributing to Knowledge Construction and Building in an Online Learning Community

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Abstract: A case study was carried out to understand the social interaction patterns of the graduate students in an online learning community in an instructional design (ID) course and the influence of their interaction behaviors on their knowledge construction and building in ID. Sixteen graduate students participated in this study over a semester's ID course. The analysis of online discussion logs and interviews provided us with rich data to help us examine the research questions. The findings pointed to four important factors influencing the quantity of students' online participation and contribution, as well as their engagement in the online learning community: (1) prior knowledge and experience; (2) group composition; (3) peripheral participation; and (4) guiding questions. The article is concluded with the implications for developing instructional strategies to facilitate the growth of an online learning community.

A Learning Community for an Ill-Structured Knowledge Domain

With the rapid advancement of communication technologies, numerous online learning communities have emerged in formal or informal educational settings. The goal of online learning communities is to advance collective knowledge and support the growth of individual knowledge through the advancement of collective knowledge (Scardamalia & Bereiter, 1994). According to Vygotsky's (1978) socio-cultural theory, individuals' cognitive development happens at two levels: first on the social level, and later at the individual level; first among people and later inside individuals. The proponents of learning communities argue that people learn best through social interactions and knowledge construction processes. From the multicultural perspective, our society is becoming increasingly diverse, which requires people to interact and work with people from diverse background (Bielaczyc & Collins, 1999). Therefore, the notion of learning communities is not only aligned with socio-cultural learning theory but also congruent with the changing needs of a digital age.

A learning community enables learners to engage in peer interactions, such as providing feedback, asking questions, receiving explanations, negotiate meanings, resolving conflicts, and co-constructing knowledge (Webb & Palincsar, 1996), which lead to collective knowledge construction and building. Such an environment should be motivating to engage members in working with the complexity of the ill-structured problems (Barab & Duffy, 2000) because in a learning community, members learn from an instructor and other members through considering important aspects pointed out by the instructor, reflecting on the questions and problems introduced by other members, and pondering multiple perspectives. A learning community provides affordances for learners to share their expertise through social interactions and allow them to see multiple perspectives (Brown & Campione, 1994), which is an important aspect for problem representation in solving complex, ill-structured problems (Feltovich, Spiro, & Carlson, 1996). Therefore, a learning community can be an effective instructional approach for complex and ill-structured knowledge domains such as instructional design (ID) (Rowland, 1992), in which the problems have unclear goals, unstated constraints, uncertain relationships among the problem elements, multiple solution paths, and multiple criteria for evaluating the solutions (Ertmer et al., 2008).

Given the numerous advantages of online learning for knowledge and skill development, we built a structured online learning community to enhance students' understanding and skill development of ID. Presumably, learners would participate actively in virtual learning communities to share information, construct knowledge, and develop expertise, provided with a structured and instructor-guided online learning community. However, we do not have sufficient empirical evidence to support this assumption. Most of the past research on learners' online interactions either focused on the quantity of members' contribution (Dennen, 2005) or the factors motivating members to contribute (e.g., Xie & Ke, 2009) instead of examining how learners interacted in or contributed to online discussions. Based on a literature review on possible reasons why students contribute or not contribute in online discussions, Cheung, Hew, and Ng (2008) summarized eight factors that influenced students' online participation in various conditions: non-facilitated learning environments, classes where online discussion is mandatory, or classes where discussion is non-mandatory. The eight factors are discussion topic, students' knowledge about the topic, instructor posting, participants' posting, availability of time, the ease of use of technology, and the community spirit. As such, previous studies had limited focus on investigating factors that motivate members to participate in online discussions. Little is known about how, if any, these factors may

influence knowledge construction and building in online learning communities, especially in the context of complex and ill-structured knowledge domains.

Therefore, the purpose of this study was to build on the previous studies and explore any other potential factors, particularly in the context of a course on instructional design, which is an archetypal example of a complex and ill-structured knowledge domain. In addition, we intended to understand how members participated in an online discussion that was structured and guided, how they interacted with each other, and how their interaction behaviors influenced their knowledge construction and building in ID. Specifically, we investigated the following two research questions: (1) What are the factors influencing the quantity and quality of online discussions in an online learning community? (2) How does each of these factors contribute to members' understanding of ID domain and ID skill development?

Method

Participants and Context

The participants of this study were 16 graduate students, with different education background, ethnicity, and experiences and prior knowledge about instructional design. The ID class was conducted in a blended learning environment, in which students met once a week on Monday evening for three hours. The online discussion forum served as a collaborative platform for building an online community. It was an extension of the weekly face-to-face class. The students were required to participate in the online discussion, and the instructor facilitated the weekly discussion by posting guiding questions corresponding to weekly reading assignment. At the beginning of the semester, students were assigned into three groups and they were required to participate in their own group's discussion. Although individual members had the flexibility to join in the other groups' discussion, such as viewing and posting messages, they must participate in the discussion of their home group. The students had to follow the discussion protocols, which specified that they must complete the following steps: posting an initial message, posting questions to peers and responding to peers, and in the end writing and posting a reflective summary of the week's discussion.

Data Analysis

A case study method was utilized to analyze the data from four sets of online discussion logs, five semi-structured interviews and observation notes. We employed open coding techniques to code interviews and students' online discussion logs (Shank, 2002). Interviews were transcribed and read so that patterns could be identified and coded. Then, we searched for variables by counting and clustering the codes we found. We displayed our data, such as comparing and contrasting different cases, and examining outliers to identify themes, which showed possible factors that affected the quantity and quality of online discussions. Finally, we triangulated our findings with descriptive statistics of the online discussions, interview and observation data.

Results

In response to the first research question, preliminary data analysis pointed out four important factors influencing the quality and quantity of online discussions in an online learning community. These four factors included: (1) prior knowledge and experience; (2) group composition; (3) peripheral participation; and (4) guiding questions.

The second research question asked how each of these factors contributed to students' learning in the complex and ill-structured domain of instructional design. The following subsections briefly elaborate on our findings related to the second research question.

Prior Knowledge and Experience

Consistent with the previous research (Cheung, Hew & Ng 2008; Ge & Hardré, 2010), the findings of our study showed that students' prior knowledge had a positive impact on the volume of postings in online discussions. In addition, our study also showed that students' prior knowledge on the discussion topic positively impacted the depth of discussion, quality of postings, and the amount of benefit the students were gaining from online discussions. For instance, in Week 5, during which students discussed the topic on learning assessments, there was a high level of interactions and number of message postings. We contributed this fact to students' familiarity with the topic because many students in the ID class were taking a measurement class at the same time. One of the students said, "I am taking Measurement and Assessment ... I do not refer the textbooks because pretty much all of it came out of my head". Although assessment was fairly new prior knowledge to most of the students, because the topic was still fresh and current in their minds, the students were able to engage in deeper discussion on some concepts, which later branched into multiple sub-topics, such as fairness of the assessments, purpose of the assessments, and how assessments might link to creativity and competition.

Additionally, whenever students applied the textbook knowledge to their real life experience, the online discussions became richer because these experiences served as anchor for reasoning and discussion. For

instance, Luke shared how he allowed his students to rework on their assignments in a college-level class he was teaching. Many online participants questioned the consequential validity of the assessment method, because they believed that college GPA could be used normatively in application of graduate schools. When Luke allowed his students to rework their assignments to gain better grades, those students might gain unfair advantages on graduate school admission. A thread of discussions regarding this view was generated. Luke later provided some contextual information to clarify the instructional situation. In the end, the group came into consensus with Luke's view that the assessment method he chose to use was valid, due to the particular instructional situation he later explained in the discussion.

Our study also found that student's prior experience also helped to enhance other students' learning. In an interview, Eva said that others' real-life examples helped her better understand instructional design theories. She said, "I cannot just envision things to theories... I am big in application, and this is how I learn to be able to apply the things we've discussed. And, giving real life experience or examples helps me to fully understand it."

Group Composition

The findings of our study indicated the importance of student composition with respect to their real-life work experience and other background knowledge and skills. The real-life experience shared by individuals helped their peers to develop an appreciation of the complexity of real-life ID problems and multiple perspectives of the issues being discussed, which are highly valuable learning outcomes for complex and ill-structured instructional design domains.

In addition, different members of the online community brought with them different expertise from which others could learn. For instance, Janet said: "Lily has a very good grasp of APA. And, just how to put something together. So, I can use hers as a model...Ella is a very good writer." Finally, people can also learn from others' who come from different countries. For example, an international student showed how assessment was performed in her home country, which was very different from how assessment was done in America.

Peripheral Participation

Interestingly, although international students brought with them the different cultural perspectives to a learning community, some of them were not as active in participating in online discussions as their U.S. peers, probably due to their language barriers and the new educational system and environment they had to adapt to. Their participation was generally lower than the domestic students. This makes sense because when participants did not have a feeling of connection to, or when they were not able to identify with a learning community, they were less likely to post. However, we found some peripheral participation from the international students from the online logs. Over the semester, more than 1,200 messages were posted, and two of the international students read almost every single message posted although they had posted very few messages. This finding was confirmed in the interviews. We expect that these students would gradually participate more in the learning community as they became more comfortable with the U.S. educational system and the new learning environment, as they became more connected to the learning community through social interactions, and as their confidence and competence to participate in learning activities grew over time.

The Role of Guiding Questions

Another important factor that affected students' engagement in online learning communities was the guiding questions the instructor provided to the participants. Throughout the class, students were required to read three to five chapters per week, which covered a lot of different topics. Janet said, "That's just so much in those chapters. If they were not guided, everybody just starting picking up odd things." Eva said, "I think without those, there are nothing to write. I think you really have to have some form of questions to address." These data suggested the importance of guiding questions in facilitating effective learning through online discussions. Good guiding questions not only led to fruitful online discussions, but also helped students with other aspects of the course. For instance, Zoe suggested that guiding questions helped her to focus on the readings, which, in turn, helped her to develop her final project.

Furthermore, the results of our study suggested that some types of guiding questions were more effective than others in terms of enhancing the quantity as well as the quality of discussions. For example, guiding questions that required students to synthesize what they had learned generated a lot of good discussions. When the instructor asked the students to describe the relationships among instructional theories, learning theories, and instructional design models, the students posted very interesting messages conceptualizing their thoughts through the use of metaphors and analogies. For instance, Ian used the metaphor of a pot of flower to show the relationships among the theories and models, which raised a lot of interest and invited a lot of questions from the group members. Some members asked him how he fit the three components in this metaphor, while other members suggested different ways to interpret the pot of flowers and represent the relationships among instructional theories, learning theories and instructional design models.

Another type of guiding questions that resulted in effective learning from the discussions was the questions that asked more experienced members to share their experience and understanding while asking less experienced members to ask more experienced members questions on a given topic. For example, when the instructor asked the experienced members to share their understanding of the roles and tasks of project managers and instructional designers while encouraging less experienced students to ask the experienced members the questions, the members in the learning community were given clear roles, either as experts to share their experiences in their own field or as novices to learn about the field. In such scenarios like this, the volume of postings went up dramatically, so did the depth of the online discussion.

Discussion and Implications

The findings of this study are consistent with recent studies that suggest students' prior knowledge has a positive impact on online engagement and learning (Cheung, Hew & Ng, 2008; Ge, Chen, & Davis, 2005; Ge & Hardré, 2010). The study results also confirmed de Wever and his colleagues' (2008) findings that assigning roles may enhance their engagement in the online community. In addition to the individual factors, this study provided further evidence about the effect of guiding questions, which were found to be very important in facilitating peer interactions and learning.

This study implied that peers could facilitate the development of individual understanding and skill development of a complex and ill-structured domain through social interactions in an online community. Yet, members must be scaffolded in order to lead to fruitful discussions. Although guiding questions are an effective way to scaffold students' knowledge construction and building process, it is insufficient. We also need to take advantages of students' prior knowledge and use it to scaffold their learning and be strategic in creating an environment for members to share knowledge and learn from multiple perspectives. Meanwhile, we also need to facilitate peripheral participants to move gradually to the center of learning. The findings of this study provide us with some useful insights in designing online learning communities, including the consideration of group composition and the design of guiding questions, in the context of skill development in an ill-structured knowledge domain such as instructional design.

References

- Barab, S. A., & Duffy, T. M. (2000). From Practice Fields to Communities of Practice In D. H. Jonassen & S. M. Land (Eds.), *Theoretical Foundations of Learning Environments* (pp. 25-56). Mahwah, NJ: Lawrence Erlbaum Associates.
- Bielaczyc, K., & Collins, A. (1999). Learning communities in classrooms: a reconceptualization of educational practice. In C. M. Reigeluth (Ed.), *Instructional-design theories and models: A new paradigm of instructional theory*, volume II (Vol. II, pp. 269-292). Mahway, NJ: Lawrence Erlbaum Associates.
- Brown, A. L., & Campione, J. C. (1994). Guided discovery in a community of learners. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 229-270). Cambridge, MA: MIT Press.
- Cheung, W. S., Hew, K. F., & Ng, C. S. L. (2008). Toward an understanding of why students contribute in asynchronous online discussions. *Journal of Educational Computing Research*, 38(1), 29-50. doi: 10.2190/EC.38.1.b
- de Wever, B., Schellens, T., van Keer, H., & Valeke, M. (2008). Structuring Asynchronous Discussion Groups by Introducing Roles: Do Students Act in Line With Assigned Roles? *Small Group Research*, 39(6), 770-794. doi: 10.1177/1046496408323227
- Ertmer, P. A., Stepich, D. A., York, C. S., Stickman, A., Wu, X. L., Zurek, S., & Goktas, Y. (2008). How instructional design experts use knowledge and experience to solve ill-structured problems. *Performance Improvement Quarterly*, 21(1), 17-42.
- Dennen, V. P. (2005). From message posting to learning dialogues: Factors affecting learner participation in asynchronous discussion. *Distance Education*, 26(1), 127-148. doi: 10.1080/01587910500081376
- Ge, X., Chen, C.-H., & Davis, K. A. (2005). Scaffolding Novice Instructional Designers' Problem-Solving Processes Using Question Prompts in a Web-Based Learning Environment. *Journal of Educational Computing Research*, 33(2), 219-248.
- Ge, X., & Hardré, P. (2010). Self-processes and learning environment as influences in the development of expertise in instructional design. *Learning Environments Research*, 13(1), 23-41.
- Feltovich, P. J., Spiro, R. J., Coulson, R. L., & Feltovich, J. (1996). Collaboration Within and Among Minds: Mastering 33333Complexity, Individually and in Groups. In T. Koschmann (Ed.), *CSCL: Theory and Practice of An Emerging Paradigm* (pp. 25-44). Mahwah, New Jersey: Lawrence Erlbaum Associates.
- Rowland, G. (1992). What Do Instructional Designers Actually Do? An Initial Investigation of Expert Practice. *Performance Improvement Quarterly*, 5(2), 65-86.
- Scardamalia, M., & Bereiter, C. (1994). Computer Support for Knowledge-Building Communities. *The Journal of the Learning Sciences*, 3(3), 265-283.

- Shank, G. D. (2002). *Qualitative research: A personal skills approach*. Columbus, Ohio: Merrill Prentice Hall.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge MA: Harvard University Press.
- Webb, N. M., & Palincsar, A. S. (1996). Group process in the classroom. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 841-876). New York, NY: MacMillan.
- Xie, K., & Ke, F. (2009). How does students' motivation relate to peer-moderated online interactions? Paper presented at the 8th international conference on Computer supported collaborative learning, Rhodes, Greece.