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Editors

Collaborative learning in online courses:
Exploring students' perceptions

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Abstract

Virtual collaborative activities have the potential to keep students engaged, create a sense of community in online courses and allow them to experience and practice virtual teamwork skills. This study presents an attempt to explore students' perceptions of online collaborative learning involving both process and product oriented activities. The online collaborative activities were used in the context of a Management Information Systems course. Results showed that perceived structure of the collaborating activity and peer interaction that takes place during the activity are positively related to perceived learning. Peer interaction and perceived learning were also related to satisfaction with the course.

Keywords: collaborative learning, online learning, virtual teamwork, learning community, peer interaction

1. INTRODUCTION

Online education has become an integral part of many colleges and universities. Results of a recent survey indicated that more than 6 million students had taken courses online during 2010, a 10% increase from the year before (Lytle, 2011). Educators are frequently faced with the challenges of adapting teaching methods to the online environment. Group work and collaborative activities are teaching methods that have been widely utilized as an effective instructional method in traditional classroom environment. Based on the constructivist perspective of learning, interaction is considered fundamental to learning experiences (Vygotsky, 1962). Additionally, social learning or learning as part of a group is an important way to help students gain experience in collaboration and develop skills in co-construction of knowledge (Brindley, Walti, & Blaschke, 2009). Ability to work in teams is a skill required to work effectively in the work place. IT sector, in particular, has witnessed an increased use of virtual teams, where members are geographically and culturally dispersed.

In spite of the challenges, collaborative learning is increasingly becoming an instructional approach for online courses (Lee, Bonk, Magjuka, Su, & Liu, 2006). An online environment provides opportunities for students to participate in collaborative learning. Learning activities can be designed to support the creation of a learning community. These activities can vary from participation in discussion boards to participating in small group activities (Koh & Hill, 2009).

There has been a significant amount of research on online education, yet development of social interaction in an online community and the impacts of student interactions on learning is an area that is less researched. Wang (2007) suggested that although advantages of student interaction and collaborative learning online

have long been recognized, there still remains to be identified what are the instructional design of course tasks and activities that promote consistent student interaction and collaboration for knowledge construction. Liu, Magjuka, Bonk, & Lee (2007) stated that it is important to examine the perceptions of online students and instructors on whether it matters to build a learning community in online courses, as well as the effective ways to build a sense of community. Abrami et al. (2011) state that the next generation of distance education should facilitate interaction that is more targeted and engaging, and research is needed to validate the underlying processes as well as the outcomes.

The purpose of this study is to explore students' perceptions towards participation in collaborative activities in online courses. Its main objective is to investigate the relations between perceptions of peer interactions, perceived learning and satisfaction with collaborative activities.

2. COLLABORATIVE LEARNING

Collaborative learning in an online classroom can take the form of discussion among the whole class or team activities within smaller groups. Another categorization of collaborative activities classifies them as either process oriented or product oriented (Macdonald, 2003). Process oriented collaboration typically includes discussions and sharing of ideas related to course content that may not lead to a product. It engages students in a structured debate on a course topic. Product oriented online collaboration, on the other hand, may lead to a final product such as a project, essay, and so forth. These tasks can be assessed using two elements: a common grade for the group based on the quality of the group product and individual grades for the contribution of each individual (Wang, 2007).

Studies have examined students' perceptions of both these types of activities. With regard to online discussions, some of the benefits that students have perceived from online discussions have been: extended time to reflect on and structure their thoughts before communicating the ideas; more time to check course readings or other sources of information; more in depth discussion than in-class discussion would permit; access to different perspectives on the same issue (Pena-Shaff, Altman, & Stephenson, 2005; Pena-Shaff et al., (2005) also reported that there are factors that hinder students'

perceptions and participation such as written apprehension anxiety, the fear of publicly expressing their comments. Some perceived that their peers' posting lacked substance and that participating in online discussion was considered a time consuming activity.

With regard to online teamwork, previous research has reported mixed results. Chiong and Jovanovich (2012) found in their study that social learning, learning through communication and knowledge exchange, was one of the perceived benefits reported by students. While students' concern about time constraints, delays in communication, differences in skills/ knowledge among team members were found to be some of the reasons that affected students' reluctance to participate in online collaboration. Goold, Augar, & Farmer, (2006) study showed that students felt that they learned more through discussions with their peers and faculty that they did by reading the text alone. However, students were less enthusiastic with working in a group within an online environment compared to a classroom setting.

Collaboration in virtual teams may be more challenging than in traditional teams. Andres and Shipps (2010) studied the effect of collaboration mode on team interactions. They found that technology-mediated collaboration experienced greater instances of communication breakdowns, misunderstandings, and difficulty moving forward compared to collocated teams. Another study by Koh and Hill (2009) indicated that students found online group activity to be more difficult than work in face-to-face groups. Students reported difficulty with communication and a lack of sense of community as the most challenging factors. Online collaborative groups may also go through delayed group development stages, taking longer to getting to know the group members or reaching agreements (Wang, 2007; Grzeda, Haq, & Lebrasseur, 2008). Birch and McDonald (2007) reported that students found the online group activity to be time consuming and frustrating. However, they agreed that it was beneficial in terms of cognitive and social learning outcomes. Another study by Lee et al., (2006) showed that students have positive attitudes towards online team activities.

3. THEORETICAL BACKGROUND

Several studies have aimed to identify factors that influence the success of collaborative

learning online. Kirchner (2004) introduced a framework for the effectiveness of collaborative learning suggesting that collaborative learning process is contingent upon technological, educational (learning) and social affordances present in the task environment. Carabajal et al. (2003) stated that there are three dimensions of groups in online learning communities. These dimensions are: task, social, and technological. Yoon (2006) studied the major behaviors that teams perform and found that three functions are important for group performance: work, social and management. Work, or completing a task, was the most frequently performed behavior, followed by building relationship among team members, and last was managing the team. At the beginning of teamwork, the social domain explained the largest portion of observed behavior. They found that technologies did not seem to be the most influential toward the development of virtual teams. A common theme across these studies is that successful collaborative learning needs to consider both task and social aspects of the activity. Lee et al. (2006) suggest that instructors tend to focus more on the task dimension of the teamwork, causing students perceptions on the social dimension to be not as strongly positive. They recommend that the assessment of the virtual teams has to cover the 'teaming process' as much as the team output.

Another stream of research has focused on the development of a sense of community in online courses. Garrison and Anderson (2003) developed a Community of Inquiry (COI) model. Based on this model, knowledge building is a contextualized social process which occurs within a community comprising students and teachers. This model includes three interacting and reinforcing elements of cognitive, social, and teaching presences. Cognitive presence refers to the extent to which participants in a community of inquiry are able to construct meaning through sustained communication (Garrison, Anderson, & Archer, 2000). Teaching presence refers to designing and managing learning, providing subject matter expertise, and facilitation of active learning. In this model, social presence is defined as "the ability of participants in the community of inquiry to project their personal characteristics into the community, thereby presenting themselves to others as 'real people'" (Garrison et al., 2000).

Rovai (2002) examined the relationship between the sense of community in online courses and perceived cognitive learning and found that students with stronger sense of community tend to possess greater perceived levels of cognitive learning. Liu (2007) also indicated close relationships exist between the sense of learning community and the perceived learning outcomes and quality. Students report that feelings of connecting and communication are vital to their online education experience (Glassmeyer, Dibbs, & Jensen, 2011).

With regard to teaching presence, several studies have indicated the importance of structure and organization in online learning. Tseng, Ku, Wang, & Sun (2009) found organization to be one of the most significant factors related to teamwork satisfaction, and they suggested that instructors should help students get organized by providing clear project descriptions and grading rubrics. Hutchinson (2007) suggests that structure is an important factor for managing the online cooperative environment. A clear understanding of the structure of the course and the collaborative activities, and how students will be assessed, contribute to a positive learning experience. Brindley et al. (2009) also suggested that transparency of expectations and clear instructions are among factors that can contribute to the effectiveness of collaborative learning online. Adequate task structure was an important dimension of the virtual teamwork identified by students in a study by Grzeda et al. (2008).

Based on this review of previous research, this study explored the three elements of creating a learning community from the student's point of view, in the context of collaborative learning in online information systems courses. The three main constructs involved in the study were: *perceptions of peer interaction*, *perceived structure* and *perceived learning*. The social dimension of collaborative learning is examined using the concept of 'peer interaction'. Moore (1989) identified three kinds of interactivity that affect online learning: interaction with content, interaction with instructors, and interaction among peers. This study focuses on the last type of interaction, peer interaction. The cognitive dimension in this study is operationalized as perceptions of learning through collaborative activities in online courses. The teaching presence aspect will focus on the perceived structure of collaborative activities. In

addition, experience with online courses will also be considered in this study. It is argued that online collaboration skills are improved over time and students' perceptions may depend on their experience with online courses. Hostetter and Busch (2006) found that the higher the number of online courses students had taken, the more positive their perceptions of social presence in the online course.

The study addresses these questions:

1. Does previous experience with online courses affects perceived peer interaction and perceived learning?
2. Is perceived structure of the collaborative activities related to perceptions of peer interaction and perceived learning?
3. Are perceptions of peer interaction related to perceived learning?
4. Are perceptions of peer interaction and perceived learning related to satisfaction with the activity and the course?

The following hypotheses are proposed:

H1. Students with previous experience with online courses have better perceptions of perceived peer interactions and perceived learning.

H2. Perceived structure of collaborative activities is positively related to perceptions of peer interaction.

H3. Perceived structure of collaborative activities is positively related to perceived learning.

H4. Perceptions of peer interaction are positively related to perceived learning.

H5. Perceptions of peer interaction and perceived learning are positively related to suggestions for future offering of collaborative activities.

H6. Perceptions of peer interaction are positively related to satisfaction with the course.

H7. Perceived learning from collaborative activities is positively related to satisfaction with the course.

4. METHODOLOGY

Participants

The participants in this study were undergraduate students enrolled in Management Information Systems course at a Midwestern university. The course was taught fully online. Students from two sections of this course were included in this study. A total of 58 students completed the course over two semesters. Feedback about student perceptions was elicited at the end of the course. Students were asked to complete a voluntary, anonymous online survey questionnaire. A total of 38 valid responses were received and used for the purposes of this study. Table 1 presents demographic data about respondents. About 47% of students reported that they had taken an online course before.

Variables	No of subjects	Percentage
Gender		
Female	22	42%
Male	16	58%
Age		
18-24	34	90%
25-35	4	10%
Over 35	0	0%
First online course		
Yes	20	53%
No	18	47%

Table 1. Demographic information about study participants

Collaborative activities

Collaborative learning in this study incorporated both process oriented and product oriented tasks.
The main task was a product oriented activity, a group project that was accomplished in small groups consisting of 4-5 students. The design of this activity was based on two principles for effective online teaching (Graham, Cagiltay, Lim, Craner, & Duffy, 2001). One of the principles encourages active learning by suggesting that students should present their course projects. The second principle recommended by Graham et al. is to allow students to choose project topics. This allows incorporation of diverse views into online courses.

Groups were established at the beginning of the semester and each group had their own area in the course web site where group members could communicate with one another using options such as group discussion board, file exchange, and email. Each group was assigned to a general course topic that typically corresponded to a chapter from the reading materials. The group then had to choose a specific topic/concept within the main topic, research the topic and prepare a report. At a specified date during the semester, the report along with the group introduction was posted in a class forum that was accessible to all students.

Students were given specific written instructions about the milestones of the project as well as report requirements. Milestones included introduction of group members to one another within the group discussion board, selection of a group leader, selection of the report topic, notifying the instructor about the topic and getting approval, completing the report and posting it on the class discussion board. Each group had to select a leader who was also responsible for posting the group introduction and the report on the course discussion board. Birch and McDonald (2007) indicated that teams appeared to function more effectively when they had a leader.

The process of planning, electing a leader, negotiating on the topic, and producing the final product required cooperation and collaboration among group members to arrive at consensus to produce the report. To ensure equal participation among the group members, criteria were set about the minimum number of articles each group member had to find and summarize for the report and a peer evaluation survey had to be completed at the end of the project.

The second collaborative task consisted of class forum discussions. Each report posted by a group became a discussion forum for the rest of the class. Students, excluding the group that had posted the report, had to read the report posted by a group for that week and comment on it. Assessment of the student postings was based on a rubric that included criteria established for earning point scores. The rubric consisted of several criteria such as reflection on the topic, new perspectives on the topic, relating the report to the reading materials, asking questions that helped further discussions, using examples, etc.

These forums were intended to provide the rest of the students an opportunity to learn more about the topic covered that week. This is similar to a group presentation in a traditional face-to-face course. Such presentations typically generate questions from the audience. In the case of asynchronous communication that takes place in an online course, the rest of the class has more time to read and respond to the posted report. The group that prepared the report was also responsible for addressing questions posted in the forum about the report.

Measurements

The measurement of variables of interest was based on items from previous studies as well as items that were developed specifically for this study. The measurement of perceived learning was based on the measurement of similar constructs by Birth and McDonald (2007), adapted for the context of this study. Cognitive learning outcomes of the activity were: development of research, synthesis, and gaining a better understating of course topics. Perceptions of peer interaction were measured using items from Tseng et al. (2009) and Birth and McDonald (2007). Structure was measured using two items were developed for the purpose of this study. A complete list of the items used to measure the three main construct is presented in Table 2 (see Appendix 1). Satisfaction with the activity and satisfaction with the course were measured by a single item that asked participants if the collaborative activity should be used for future course offerings and about the extent at which this course met their expectations. Most questions required respondents to select an option from a five-point Likert scale indicating the level of agreement with the corresponding statement (1 represents strongly agree and 5 strongly disagree).

5. DATA ANALYSIS AND RESULTS

Initially, exploratory factor analysis using varimax rotation was employed to uncover the underlying structure of the set of the variables used. This analysis indicated that 3 factors were extracted. All items loaded in the corresponding constructs, expect for one item that showed double loading and was dropped from further analysis. Table 2 shows the results of the factor analysis. The internal consistency of each factor was estimated by Cronbach's reliability alpha. Alpha coefficients values ranged from 0.72 to

0.84, indicating acceptable internal consistency of items for each construct.

For the entire sample, mean and standard deviation values for perceived learning were M=2.25 and SD=0.78, for perceptions of peer interaction M=2.71 and SD=0.82, and structure M=1.84 and SD=0.74.

The first hypothesis states that students who have taken online courses before will have better perceptions of learning from the collaborative activity compared to first-time online students. Mann-Whitney U tests were conducted to test this hypothesis. Results indicate that students who had taken online courses before did not differ significantly in their perceptions of learning from the students who were taking an online course for the first time (U=163, p=0.617). Similar results were observed with regard to peer interactions (U=148, p=0.347) and perceived structure (U=175, p=0.879). Thus, this hypothesis is rejected. This is a positive finding because it indicates that students who were taking an online course for the first time felt that they benefited from the collaborative learning at the same level as students who were more experienced with online courses.

Research question two aimed at exploring the relationship between perceived structure of the collaborative activities and perceptions of peer interaction and perceived learning. For this question, data were analyzed using linear regression analyses. These tests showed that perceptions of structure are significantly related to perceived learning (β =0.41, t(36)=2.71, p<0.05 and R^2 = 0.17, $F(1, 36)$ =7.538, p <0.05). To examine any effect of experience with online courses, the same tests were run separately for each group. These tests revealed that this result was significant only for students who had taken online courses before (β =0.52, t(16)=2.43, p<0.05), while for students new to online courses this relationship was not significant (β =0.273, t(18)=1.20, p>0.05).

Similar results were observed for the relationship between perceived structure and peer interaction. For all subjects, perceived structure was significantly related to peer interaction (β =0.36, t(36)=2.33, p<0.05 and R^2 = 0.13, $F(1, 36)$=5.46, p<0.05). This relationship was significant for students with experience in online courses (β =0.52, t(16)=2.43, p<0.05), but not significant for

students who were taking an online course for the first time (β =0.22, t(18)=0.98, p>0.05). These findings imply a moderating role of the experience with online courses in the relationship between structure and perceived learning. One might expect that for students who are new to online courses, perceptions of clear instructions and grading rubrics may be more important and related to the perceived learning and peer interaction. In this study this seems to be the case for students who have taken online courses before. One reason for this result may be the fact that students new to online course experience may not have a basis of comparison and prior experiences with various methods of presenting the instructions for online activities. In addition, this may suggest that students new to online courses experienced peer interaction and learning in spite of how they perceived the instructions to complete the tasks. Hypotheses two and three are supported.

To test hypothesis four, a linear regression test was employed to explore the relationship between peer interaction and learning from collaborative activities. This relationship was significant (β =0.35, t(36)=2.28, p<0.05 and R^2 = 0.13, $F(1, 36)$=5.18, p<0.05). Thus, this hypothesis was also supported suggesting that students with stronger perceptions of interactions tend to possess greater perceived levels of learning.

To capture the overall level of satisfaction with the collaborative activity, participants were asked if this activity should be used for future course offering. First, frequency analysis revealed that almost 80% of respondents strongly agreed or agreed that this activity should be used in the future. This is an indication that the majority of students who participated in the study were satisfied with their experience in this activity. Second, to test hypothesis five, a multiple linear regression analysis showed that both peer interaction and perceived learning were significant predictors of future use(R^2 = 0.40, F(1, 35)=11.91, p<0.01).

Relationship between peer interaction and satisfaction with the course was examined to test hypothesis six, using a linear regression analysis. This relationship was significant (β=0.60, t(36)=4.46, p<0.01 and R^2 = 0.36, F(1, 36)=19.97, p<0.01). Relationship between perceived learning from collaborative activity and satisfaction with the course was also

significant (β=0.42, t(36)=2.78, p<0.01 and R^2 = 0.18, F(1, 36)= 7.71, p<0.01). Both hypotheses six and seven were supported. This is an indication that both aspects of collaborative learning, interaction and learning, are significant predictors of perceived success with the online course.

6. DISCUSSION AND CONCLUSIONS

This study aimed at exploring students' perceptions of collaborative activities in online courses. Based on the Community of Inquiry model, three main constructs were presented and analyzed. 'Perceptions of peer interaction', 'perceived learning' and 'perceived structure' were used to capture the three dimensions of an online learning community, Social Presence, Cognitive Presence and Teaching Presence.

Results showed that students' perceptions of the way the instructor has provided structure and guidance for the online collaborative activity are related to their perceptions of peer interactions and to the perceived learning. In other words, the better the students understood the instructions and assessment of collaborative activities, the more they perceived they were connected with their classmates and the more they learned from these activities.

One of the main research questions in the study dealt with the relationship between the perceived interaction and perceived learning. The results indicated that students with a stronger feeling of connection and interaction with other students, or sense of community, felt they learned more from the collaborative activity.

The study also indicated a positive relationship between the perception of interaction, learning and satisfaction with the activity and the online course. The role of previous experience with online courses was also considered in this study. While previous experience was not related to perceptions of interaction and learning, there were indications that this factor may moderate the relationship between the perceived structure and perceived interaction and learning.

The Internet has become popular among educators because of its ubiquitous nature that supports education through the sharing and distribution of online course materials. Teaching styles also need to adapt to the online environment, to incorporate methods that encourage cooperative and collaborative learning. This study contributes to the current research on collaborative learning from both theoretical and practical perspective. From the theoretical perspective, this study explored constructs suggested by previous research as important to be investigated in the area of distance education. Peer interaction is a new construct introduced in this study to capture the sense of community created in the online environment using the collaborative activities. This concept also has important practical implications. Omar, Bhutta, & Kalulu (2009) suggested that student-to-student interaction can be a powerful tool to increase online participation, minimize the chances of drop-out and increased levels of motivation. MacDonald (2003) stated that by interacting with their peers, students become familiar with the language of the discipline and assists in their ability to read and write appropriately within the discipline.

From the practical perspective, this study presented a set of collaborative tasks that can be used to engage students in the online environment and how they are perceived by students. Importantly, this collaborative activity included both process and product oriented collaborative tasks.

Limitations of the study include the small sample size, so caution should be exercised when generalizing the findings of this study. The findings are also limited to one particular course and one specific collaborative task.

This study offers evidence that experiential teaching practices can be transferred from traditional to virtual classrooms, by including adequate support for students. Building a sense of community is important to promote collaborative learning. To promote a sense of connection, instructors should incorporate various opportunities for students to interact with their peers. It's important to continue to explore activities that are most effective for online collaborative learning.

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Appendices

Appendix 1

Items	Factors		
	Learning	Peer Interaction	Structure
I learned from reading other students' comments on the posted reports.	.872		
Reading and commenting on the reports of other teams was useful for learning in this course	.841		
This activity was beneficial to my learning in this course.	.696		
Comments and questions from other students in the class regarding my team's report were useful and might help me to improve my future work.	.619		
This activity allowed me to develop more effective electronic communication skills.	.608		
Communicating with my team members helped me understand what we were supposed to do in the team project.		.849	
Interacting with my team members increased my motivation to learn.		.803	
I enjoyed the experience of working in collaborative group with my team members.		.764	
The group project helped to reduce the sense of isolation that I sometimes feel as distance learner.		.621	
The group project provided me with an opportunity to interact with other students in this course.		.544	
The group project helped me become more confident in using the course discussion board.		.502	
I think the grading criteria for the group work given by the professor were clear enough.			.862
The group project instructions were stated clearly.			.790

Table 2. Results of factor analysis