Learning Together: Exploring Group Interactions Online

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Abstract

Recent studies in the literature on online learning highlight a constructivist approach to knowledge-building in Web-based environments. In this case study of an online course, students were introduced to a constructivist orientation toward learning, a requirement to work in a new learning environment, and a challenge to accomplish academic work with groups of colleagues. Students learned successfully how to accommodate these requirements. In particular, this article tells how communication strategies, collaboration with one another, interaction throughout the course, and consistent participation in the growing online database supported students' perceptions of self-efficacy and their emerging commitment to a constructivist approach to learning.

Résumé

Des études récentes, issues de la littérature sur l'apprentissage en ligne, mettent en relief une approche constructiviste de la construction de connaissances dans des environnements utilisant la technologie Web. Dans cette étude de cas portant sur un cours en ligne, les étudiants ont été exposés à une orientation constructiviste de l'apprentissage, ils ont dû travailler dans un nouvel environnement d'apprentissage et ils ont été mis au défi de travailler avec des groupes de collègues. Les étudiants ont appris avec succès comment s'adapter à ces conditions. L'article décrit comment les stratégies de communication, la collaboration, l'interaction continue et la participation à l'alimentation de la base de données en ligne ont contribué à donner aux étudiants un sentiment d'autoefficience et ont causé l'émergence d'un sentiment d'engagement envers une approche constructiviste de l'apprentissage.

Introduction

The new knowledge economy and the emergence of affordable technologies have combined to foster a growing demand for distance education and training. Web-based learning has been espoused by hundreds of institutions of higher learning as an effective mode of distance course delivery (Berge & Collins, 1995; Bullen, 1998; Duchastel, 1997; Duderstadt, 1999; Eastmond, 1995; Schrum, 1998). Technological advances in delivering courses, workshops, and seminars have demanded a parallel development of effective teaching methods and learning strategies.

With the relatively recent history of Web-based course delivery, new understandings of the potential roles of institutions, instructors, and learners have begun to emerge in the literature. Current research has pointed to these critical issues: (a) learner perspectives on Web-based

learning and requirements for support in the Web-based environment (Burge, 1993; Eastmond, 1995; Gabriel, 1999); (b) the institutional and faculty approach to the new technologies (Bates, 2000; Hanna, 1998; Harasim, 1999; Pajo & Wallace, 2001); (c) course design and pedagogical frameworks (Berge, 1999; Huang, 2000); and (d) communication and socialization in virtual spaces (Rourke, Anderson, Garrison, & Archer, 1999; Stacey, 1999; Tu, 2000).

Earlier delivery of distance education frequently employed a transmission model of teaching in which students passively received information provided to them by their instructor (Bullen, 1998; Burge, 1988). The new technology of the Internet—with choice of synchronous or asynchronous communication, connections any time or anywhere, increasingly sophisticated video and audio streaming—has offered course designers a wide range of possibilities for actively engaging students in the process of learning. Web-based learning has presented educators with the possibility of developing a collaborative learning process based on a transformative model of learning that supports students' construction of knowledge (Gabriel, 1998; Garrison, 1997; Haughey & Anderson, 1998; Hiltz, 1994; Nachmias, Mioduser, Oren, & Ram, 2000). Collaborative course activities in a shared learning space can be developed to support the creation of a learning community (Hiltz, Coppola, Rotter, & Turoff, 2001; O'Reilly & Newton, 2002; Paloff & Pratt, 1999; Solomon, 2001; Tu & Corry, 2001).

Many educators accept the proposition that learning is a socially mediated process (Scardamalia & Bereiter, 1996; Vygotsky, 1978) and that we develop understanding through interactions with others. Paloff and Pratt (1999) propose that constructivism, with its foundation in situated learning, is the dominant educational theory today. Jonassen, Davidson, Collins, Campbell, and Haag (1995) suggest that "Constructivists believe that our personal world is constructed in our minds and that these personal constructions define our personal realities.… Meaning making, according to constructivists is the goal of learning processes; it requires articulation and reflection on what we know" (p. 11). Applying a constructivist framework to the development of educational courses requires learners to come together to discuss, learn, and distribute knowledge throughout the entire community of practice. Virtual learning groups represent one instructional strategy used in the online environment that can support the development of a collaborative learning community (Hasler-Waters & Napier, 2002).

Learners in Web-based courses with constructivist orientations are frequently expected to work in groups to share ideas, develop a project, or participate in a debate (Bonk & Reynolds, 1997). Well-planned projects completed by virtual groups have enabled students to achieve improved learning success (Carr-Chellman, Dyer, & Breman, 2000). Learning in virtual groups has significant potential for student collaboration, cooperation, and co-construction of knowledge (Bailey & Luetkehans, 2001; Conrad, 2002; Lock, 2002). However, experience has shown that working in virtual groups and building a learning community require commitment from all members of the online community. These activities facilitate the development of a learning community whose interactions are located in the virtual space of the online environment. Students who are required to work collaboratively online must commit increased time and develop new strategies to get to know each other, plan work together, and maintain effective communication in a Web-based environment (Gabriel, 1999; Mason, 1998).

Although the number of Web-based courses continues to soar, the pedagogy of developing successful online learning environments and expectations for groups working online is not well documented at present. Therefore, this research study was developed to explore: (a) the attitudes of online students toward learning in a constructivist learning environment; and (b) what students identify as the benefits and challenges of working in small virtual groups.

Context of the Course

The research context provides a basic framework for this study of learning in virtual groups. The research site was an elective online Master of Education course at a small Maritime university, and I was one of the two course instructors. The course was conducted in May and June, and provided an opportunity for those master's students who were interested in leadership in the area of educational technology to develop a knowledge base that could be applied in the educational setting. The following sections detail the epistemological approach to teaching online and the online environment used for this course, the organization of the course, and the learners and instructors who participated in the online community.

Epistemology and the Online Environment

The course was based on constructivist epistemology and focused on supporting learners' construction of understanding. Students were invited to explore their own beliefs and questions about technology and its uses in education. Participants had the opportunity to investigate new forms of activity, discourse, and reflection as they worked in the online environment. The expectation was that the group would be working together to develop new understandings of the role of educational technology. The specific learning outcomes of the course included developing the skills to work effectively and collaboratively in an online environment, exploring personal beliefs about technology in education, and identifying technology problems or questions and potential solutions to the problems thus identified.

Knowledge Forum was the online environment chosen for this course. Scardamalia and Bereiter (1992, 1996) and Scardamalia, Bereiter, and Lamon (1994) initially developed the online environment CSILE (Computer Supported Intentional Learning Environments) as a collaborative knowledge-building tool. These researchers developed an online learning environment that would facilitate the capability of users to articulate their own learning, reflect on it, and engage in discourse with other learners. This course focused on the development of discourse and knowledge about educational technologies. Knowledge Forum (formerly CSILE) facilitated the development of a community database as participants posted problems in appropriate sections of the online database, read and reread the contributions of other participants, and worked together to develop better understanding of problems and possible solutions. The knowledge represented by these communications was then available on a continual basis for participants to retrieve, revisit, revise, and develop further.

Knowledge Forum had a number of features that participants used to support the construction of knowledge, including views, annotations, build-on notes, scaffolds, and rise-above notes. The online environment consisted of *views* where participants posted their notes. In this course, there were 32 active views including: (a) the readings and discussion for each week; (b) the course calendar and syllabus; (c) three small group activities; and (d) each student's final view that reflected personal learning during the course. When participants posted notes in Knowledge Forum, they could post their thoughts as an *annotation* or as a *build-on.* Annotations refer to the capability of users to attach comments directly into another user's message. These were similar to Post-it notes, which could be accessed when the icon was clicked. Annotations tended to be fairly short and dealt directly with a portion of the message being read; for example, one student wrote an annotation in another's note, stating, "I love your metaphor for learning!" The build-on notes addressed more substantive issues that emerged from the initial note, were lengthier, and more thoughtful in nature. These appeared in the database as a separate posting attached to the initial note. Scaffolds facilitated the organization and development of thinking in a note, when participants outlined in advance what issues they were addressing. Rise-above notes allowed par-

ticipants to gather notes together according to a common property and then analyze and synthesize the common thread among the messages.

Organization of the Course

Students and instructors met face to face for three three-hour evening sessions during the term. The first face-to-face meeting occurred on the opening night of the course. During this class participants were introduced to the course content and to the online environment in which they would be working. The second meeting occurred mid-way through the course. The focus of this meeting was to deal with technical issues (including a shift to a new server), content-related issues, and a discussion with two guest speakers—a teacher and a Department of Education consultant—who shared their experiences with learning online. The third face-toface gathering occurred on the last night of the course and focused on a celebration of learning. The gatherings were planned because the instructors believed that the face-to-face meetings would facilitate the development of an online learning community, and also because meeting face to face did not pose a difficulty for any student—no participant traveled more than an hour to attend the meetings.

In this online course—the site of this research project—three activities in particular were developed to explore working in virtual learning groups. In the first activity, pairs of students went online together to explore and critique information and communication technology curricula in particular jurisdictions, synthesize their work, and post their findings in a new view. For the second group activity, the class of eight students (6 women and 2 men) was divided into two groups of four and asked to work on a roundtable activity focused on the digital divide. In this roundtable, participants were required to read resources discussing the digital divide, post their initial responses to the readings, read each other's postings, have a discussion online, and develop a group response to the problem. The third activity involved pairs of students working together to critique and further develop final views of their personal learning in the course.

Aside from the three face-to-face meetings, course work was conducted online. Various readings were posted in the Web-based environment, and students were expected to read, reflect on these, and respond on a weekly basis using annotations or build-on notes. As a final course requirement, students were asked to choose a particular technology problem or question that they faced in their professional lives and investigate this personal interest throughout the course. Student investigations included exploring telefield trips as an educational experience, investigating authoring with multimedia, and examining the potential of using Web-based environments to provide ongoing instructor and peer feedback to junior high school students.

Learners

The eight participants in the course began with varying levels of technological expertise, although none of the students had ever taken an online course before. As well, students were at varying points in their MEd program. This was the first course in the MEd program for two of the students, whereas it was the last course in the program for two others. Three of the participants taught in the K-12 system; one was an adult educator; one international student was a former college instructor; two participants worked in the university, and the eighth was a public school teacher on an extended maternity leave. Four of the participants in the course knew other students in the course before the online work began. The two participants working in the university knew each other in their work context, and two school system educators knew one another and had collaborated on other projects before beginning this course. In fact participants used several ways to communicate with each other throughout the course. Knowledge Forum

was the public forum, and participants had lengthy discussions online. There were the three planned face-to-face meetings of the class. As well, five of the course participants communicated by telephone (only 2 students required long distance calls). The telephone communications took place during the small-group activities in particular, with members of various pairs discussing their work by phone. They said that these "back door" communications enhanced their comfort level and accelerated the development and completion of their online work.

Instructors

The instructors in this course saw their role as facilitators who (after the initial organization of the course and the development of the database) questioned, affirmed, suggested organizational strategies, provided technical support as necessary, and nudged students forward in their thinking. The instructors took active roles in the course and entered discussions in many of the views. The course was designed to engage participants actively in an online learning community, and the instructors were integral, contributing members of this community.

I was one of the two instructors in the course and as such took great care to ensure that students who enrolled in the educational technology course would feel free to give or withhold their consent to participate in the research. The second instructor was not involved in the research study and did not collect or analyze the research data. Students who enrolled in the educational technology course were assured that there was no pressure to participate in this study and that their decision would have no effect on the marks received in the course. All students who enrolled in the course agreed to participate in the research study. The research interviews were conducted after the course and student evaluations were completed and final marks were posted.

Research Methods

The research orientation in this study was constructivist in nature. The constructivist paradigm provided a set of basic beliefs about the nature of reality and knowledge that underpinned the study (Fosnot, 1996; Steier, 1991). Guba and Lincoln (1994) suggest that "Constructivism … sees knowledge as created in interaction among investigator and respondents"
(p. 111). The approach in this research was to construct a case study of the online course, with a particular focus on the activities of participants as they worked in groups—specifically on the three group activities. Merriam (1998) offers this definition of a case study: "A qualitative case study is an intensive, holistic description and analysis of a single instance, phenomenon, or social unit" (p. 27). In this study the course and the group of eight participants delimited the boundary of the case.

Data Collection

Data collection in this study used both qualitative and quantitative approaches (Patton, 2002). These involved in-depth audiotaped and transcribed interviews and content analysis of the notes produced by the participants in the context of the course. Interviews were chosen as the primary means of data collection (Fontana & Frey, 1994; Kvale, 1996) because they allowed me to share in the perspectives of each individual participant about the effect of groups and about learning in the online environment. The interview protocol was developed to encourage participants to share their own experience of learning online, any strategies they developed for learning in the online environment, and the challenges and benefits of working in groups. The interviews ranged from 45 to 60 minutes in length. Transcriptions were shared with participants, and they were invited to make any changes necessary for clarification or accuracy. One participant suggested a small

clarification of a statement he had made.

A secondary method of data collection was document analysis. Marshall and Rossman (1999) suggest that "the review of documents is an unobtrusive method, rich in portraying the values and beliefs of participants in the setting" (p. 116). The study was conceptualized as a collaborative venture in which I and the participants were engaged in co-constructing an understanding of learning in groups online. Throughout the course I read all the notes that were posted by the participants. When the course was completed, I analyzed the notes posted in the Knowledge Forum environment for demonstrations of interactivity and knowledge construction using an Analytic Toolkit available in the Knowledge Forum database.

Data Analysis

The open-ended interview protocol allowed participants to share their attitudes about the process of learning online as well as the effect of working and learning in online groups. The interview transcripts were read and reread to identify patterns and themes. The transcripts were then converted to ASCII text and entered into a NUD*IST (Non-numerical, Unstructured Data Indexing, Searching and Theorizing) database. The use of this computer-assisted data analysis software facilitated the coding, sorting and analyzing of the themes identified in the interviews. Paragraphs were chosen as the unit of analysis. The initial coding emerged from a cross-case (cross-interview) analysis, as participants' answers to the interview protocol questions were grouped together by topic (Patton, 2002). Text searches were then conducted to test the database for confirmation of possible new themes as they were identified.

In this study, the Analytic Toolkit available to Knowledge Forum instructors was used to analyze the activity and learning reflected in participants' notes posted to the Knowledge Forum environment. The Toolkit allows instructors to assess basic knowledge-building measures: how students are using the features included in Knowledge Forum, including the notes created and read (or at least opened), "who read whose notes?" who built onto others' notes, who linked their notes to whom, and who read/opened particular notes. This information is reported in a table in the study findings.

Findings

The participants in this research study identified a number of issues that emerged for them in the context of learning online in groups. The following themes emerged from the interviews with participants: (a) developing an understanding of the constructivist approach to learning used in this course; (b) how the group of students enrolled in this course developed as a virtual group; (c) the benefits participants discovered in working online together and their own growth and learning; and (d) the challenges they faced, in particular learning to deal with time issues. Finally the quantitative data from the Analytic Toolkit are presented.

Themes Discussed by Participants

The interview protocol focused on attitudes toward learning in an online environment, as well as on the challenges and benefits of working in online groups. Participants discussed the paradigm shift that they had encountered as they dealt with the constructivist framework of the course, as well as the particular benefits and challenges of working in small virtual groups.

Constructing knowledge

Participants in this study were enrolled in an online course that was conceptualized as constructivist in nature. Students were asked to read and respond to the course texts, but this was only the initial component of the learning process. Students were also asked to read their

colleagues' comments and respond to the ideas posted by other learners. This course design was chosen to support the co-construction of knowledge among members of the course. Three small-group activities were included in the course work: (a) a roundtable discussion about the digital divide; (b) discussing and evaluating current information technology curricula; and
(c) reading, critiquing, and discussing a partner's final views of learning. These were included in the design to enhance interactivity and learning in smaller groups. However, in the interviews a large majority of students reported that they believed the entire class of eight students functioned as an online learning group. In their conception, all the course activities were learning group activities, not only the three that were so designated.

As these students began to work in the online environment, they came to realize that this course was based on constructivist learning principles and that there was a different flow to the course. They developed an understanding of the recursive nature of knowledge construction and how their ability to review, rethink, and revise their previous work supported their own learning. However, one student commented, "it was a challenge for me to be comfortable with the expectations that everyone was responsible for their own learning" (RD, Interview). Another suggested that she would have been more comfortable with greater structure and less flexibility.

> I guess what I had to do was unlearn a lot of the strategies that I had previously learned. So it was more an unlearning process for me … I had to unlearn that I was studying for a mark, or I had to unlearn the feeling of putting out a piece of work that may not be my best work for others to see, and to feel comfortable … without it being a final product. (TH, Interview)

How the course was structured and how work was evaluated caused a number of the students to shift their basic understanding of learning. Students came to an understanding of learning as a process, not a product. "The goal is knowledge building, not knowledge collecting" (LX, Interview). All the participants in the course were ultimately able to work through the challenge of this paradigm shift and learn effectively in the online environment.

Learning online together

Members of the small learning groups did learn from interactions with their colleagues. Students came to the course with varying prior experiences and perspectives. When these were shared in the context of the online work, students learned from each other.

> I found that just reading what other people had to say.… helped with what I wanted to contribute as well … people have such good ideas, and you don't realize them until you hear them or see them, I guess in this case … You just get to hear the other people's opinions and things you don't think of until you hear them, and then you think, "Oops, why didn't I think of that? That's great," you know! (WN, Interview)

Six students believed that there was a fascinating diversity of viewpoints that enriched learning opportunities in the course as students developed an appreciation for multiple perspectives. However, some students found that they tended to read and respond most effectively to the postings of other students with views and interests similar to their own. Even in the group of eight, then, smaller groups tended to form and respond most frequently to one another. Even so, participants believed that the connections they had around various topics enhanced their ability to work together online.

In two of the virtual group tasks, students had the opportunity to choose their own partners. They posted notes in the Knowledge Forum database expressing their interest in working on a

particular task, and groups were formed as other students expressed an interest in working on that task together. Six of the participants found that these partnerships worked well on the whole, whereas two students would have preferred not to work in the smaller groups. These were two students who missed continual contact with others in a face-to-face environment.

> One of the nicest things for me in taking my master's is that interaction, the face-to-face contact with other professionals, and having a conversation and talking about ideas or concepts … I didn't feel it was the same. And I missed it. (RD Interview)

There were also technical glitches that caused delays in accomplishing the work in two of the virtual groups, but the partners were eventually able to work through the challenge and complete the task. Group members commented on the need to be respectful of other people's time commitments, on the importance of doing one's share, and on the strategy of negotiating mutual understanding if there were differing technological skill levels. Three students found that working in pairs facilitated their learning more than working in the larger group of eight, whereas two others believed that working in the larger virtual group allowed more flexibility in learning. Three students reported that there was no difference in how they learned in the various groupings of two, four, or eight students.

Benefits of the online environment

As students worked through the course, they discovered a number of benefits to learning in the online environment. Participants believed that they learned more quickly, because everyone was aware of the learning processes of their colleagues, and they learned from one another. In the context of these interactions, participants in the course also learned how to ask questions that led people to think and to discover new insights. Learners shared resources discovered as learning activities were completed. After some practice, participants in this study found it easier to work in groups. The course itself provided a model of how technology might be integrated into the classroom for several participants who taught in the K-12 system.

Participants reported that they learned about themselves as learners through their interactions and work; they gained confidence in themselves as online learners, and grew in their perception of self-efficacy (Bandura, 1995). "It was very new to me.… very frightening. Intimidating, I guess, at first" (RD Interview). As students accomplished the work of the course, they reported a increasing belief in their own ability to learn efficiently in this environment. Even the two students who indicated a preference for face-to-face classes confirmed that they would enroll in another online course. Although the online course was not their preferred way of learning, they believed that Web-based education would continue to grow in importance. The online database allowed learners to track their own growth as learners and to see how their thinking had progressed over time. By the conclusion of the course, all eight participants shared their belief that they had built a strong community of learners through their work together online and their three face-to-face meetings. As one participant noted,

> I am beginning to see that the technology of an asynchronous database is allowing us to "do better things." We can track the process of growth, change and creativity … A thought that is ahead of its time may be lost in a non-technical discussion and never be rediscovered. But the database allows us to save it for later. Solomon said, "There is nothing new under the sun." I still think he was right, but I think he would have been impressed by the means we have to discover it over and over again for ourselves in a community of knowledge. (LX, Note)

Challenges of the online environment

Students in the course also identified challenges they faced in the online environment. Although several of the participants were familiar with Web-based learning, others had little prior experience. Because of this, becoming familiar with the software and learning how to navigate in a virtual space was uncomfortable for a number of students. Five participants reported their initial frustration with the process of learning online, because they had to learn how to use the program, deal with technology crashing, and learn course content at the same time. A further challenge for many was the time required to frame their responses to others in the course and post these online. Some students also found that differing work schedules posed a problem, particularly during small virtual group activities. However, the major challenge identified by all the students was keeping up with the volume of reading. Some students reported feeling compelled to go online and continually catch up with any new postings that might appear.

> I have reflected on the demanding nature of the class because of the need to be constantly involved. If I don't have time to read and respond for a few days, it is if I had fallen asleep in class. Without the interaction I seem static while the knowledge process continues. A sense of urgency unfolds each week as the database begins to unfold. The process is compelling and thus demanding. (LX, Note)

Time in this online course posed both a challenge and an opportunity. Participants found that there were time constraints: (a) in trying to read everyone's postings; (b) in going back and reading the new messages that were posted about material from earlier weeks in the course; (c) in trying to learn to work in the online environment at the same time as learning the course content; (d) and in becoming comfortable with each other as partners in course activities. "The time glass was really disempowering for me, I guess" (RD, Interview). On the other hand, there were also time benefits in this online course including: (a) more time to think and compose responses than would have been available in a face-to-face classroom; (b) no time spent on the road to get to class twice a week; and (c) great flexibility in terms of when students would complete their work. Some students reported that they completed their online work early in the morning before other members of the family arose, whereas others found it most convenient to work late in the evening. The online environment accommodated these different learning preferences.

Content analysis

The uses that participants made of the knowledge-building features of Knowledge Forum are an indication of the interactivity and co-construction of ideas in this online environment and are reported in Table 1. Information is presented on the notes participants contributed to the database, notes linked to other notes, notes read and revised, and notes that were produced as build-ons and annotations.

The analysis provided by the Analytic Toolkit demonstrated that the eight participants in this study contributed 527 notes to the database. The number of notes posted by individual students during the course ranged from 49 to 91, and the average number of notes contributed per user was 67, which is a substantial number of interactions. This is found in the column *# Notes created.* The number of notes written by a user that were linked to other notes is addressed in the column labeled *%Notes linked*. These links include build-on notes, annotations, or making references to other notes. The percentage of linked notes was 77.5%; these links indicate reading and reflection on the part of the writer. The percentage of notes that had been read (or at least opened) by each user was reported as 58% for the students posting messages in this database;

this information is found in the column labeled *% Notes read*. With an adjustment for one student who only read 21% of the total number of notes, the other participants averaged reading 64% of the notes in the online environment. This is still a somewhat low percentage for students in online courses, however.

The column labeled *# Revisions* demonstrates the number of revisions produced by a learner. This indicates the extent to which students were recursive in their thinking and returned to writing previously posted to rethink and review it. The mean number of notes posted was 67, and the mean number of revisions was 49.5. This reflects a substantial commitment to review. This finding may be due to the strategy that a number of students reported using: after getting to know each other online, they became selective as to which notes they chose to read. (Some students had not even read all the notes posted by the instructors). Another possible explanation is the physical arrangement of the notes in the Knowledge Forum client version. When a number of notes were posted to these views, they tended to look cluttered, because each note linked to another note was physically represented with a line attaching one to the other. If students did not use the *find* feature to pull up the new notes posted since their last visit to the database, the visual changes in a particular view could be quite dramatic and cause difficulty in finding new postings.

Table 1
Participants' Knowledge-building Activity in Knowledge Forum Online Database

User	# Notes created	% Notes linked	# Revisions	% Notes read	# Notes in build-ons	# Annotations
NN	85	82%	64	57%	68/85	222
RD	73	71%	18	57%	50/73	59
TH	58	79%	103	70%	40/58	41
WN	54	91%	63	81%	41.54	57
MT	57	82%	33	57%	40/57	57
LX	69	75%	56	62%	47/69	97
WX	49	59%	25	21%	28/49	28
DW	91	79%	33	61%	61/91	39
Mean	67	77.5%	49.5	58.2%	46.9	75
SD	14.2	8.72%	26.06	16.22%	11.94	58.8
Median	63.5	79%	44.5	59%	44	57

The mean number of notes produced as build-ons (building onto another student's posting) was 46.9. This information is found in the column labeled *# Notes in build-ons*. This number refers to the knowledge-building activity that was going on in the database as reflected in comments and follow-up thoughts that students would post to one another. The mean number of notes produced as annotations (found in the column labeled *#Annotations*) was 75. This category refers to immediate comments made by learners as they read the notes posted by their colleagues and made short comments that they then posted in the actual message of their colleague. The Analytic Toolkit confirmed what I had observed as I read the notes posted by participants in the Knowledge Forum database. With the exception of one participant, learners were involved and

committed to reading, reviewing, and revising the notes posted in the Knowledge Forum database. This activity was an indication of engagement in the course, including engagement in the constructivist small group tasks.

Discussion

The learners in this study enrolled in an online course with varying levels of skill in using the technology, with dissimilar levels of experience in communicating electronically, and with varying educational backgrounds. They faced challenges in learning how to work in the online environment, how to cope with technology glitches, and how to communicate and accomplish the work of the course in a small learning group. The eight participants in this study all successfully completed the course requirements in spite of these challenges. Learners had differing views of their own ability to achieve success, but not one student anticipated that he or she would be unable to cope with the demands of learning in an online environment. The participants shared their approach to learning and their perception of themselves as lifelong learners throughout the study. They had high levels of a sense of academic efficacy and a strong assurance in their ability to succeed at the academic task (Bandura, 1986, 1995). The participants in the study shared their desire to continue to learn and a firm belief in their eventual success in the learning environment.

One of the main challenges articulated by a number of participants was developing an understanding of the constructivist orientation of the course (Jonassen et al., 1995; Paloff & Pratt, 1999). This approach to learning required a paradigm shift, particularly for the students who were early in their master's program. Some learners found the expectation that they were to take responsibility for their own learning and to use the instructors as facilitators of that learning intimidating. The requirement for articulation of personal beliefs, reflection on growth, and sharing that growth with others was a shift in how several of the learners had approached learning before the course. This shift took place throughout the time frame of the course and formed a major component of the personal growth experienced by several of the participants in the study.

Lock (2002) has proposed that there are four cornerstones for the development and maintenance of online learning communities: communication, collaboration, interaction, and participation. These four strands are woven throughout the course described in this case study. The participants in this study believed strongly that they were members of a learning group or community. The group took on different configurations throughout the course, depending on whether learners were engaged in a paired or a roundtable activity or a class discussion. All the work that learners accomplished was predicated on consistent and frequent communication. Learners used a variety of communication tools including postings to the Knowledge Forum database, e-mail, phone calls, and face-toface visits. Robey, Khoo, and Powers (2000) suggest, "Thus it appears that face-to-face communication may be an important ingredient in making virtual teams more effective" (p. 54). Learners in this study agreed with this point. However, the extent of off-Web communications that took place among students was not shared with the instructors until the last face-toface meeting. When this was probed, learners shared their viewpoint that communicating off-Web seemed to be counter to the focus on communicating via Knowledge Forum, even though phone numbers had been shared in class and students felt free to visit instructors face-to-face in their offices. This is similar to results reported in other studies (Gabriel, 1999; Gabriel & MacDonald, 2002). This attitude seems to be held more strongly by students who are inexperienced in working online. Those learners who are pursuing an entire program online, as opposed to taking a single course, are aware of the benefits of using multiple

communication channels to accomplish their tasks. Whether they chose to communicate off-Web or not, students in this study stressed the effect that communication with one another had on their learning.

Collaboration may be defined as "the process of shared creation: two or more individuals with complementary skills interacting to create a shared understanding that none had previously possessed or could have come to on their own. Collaboration creates a shared meaning about a process, a product, or an event" (Schrage, 1991, p. 39). In three particular group activities, learners in this study were expected to collaborate with one another. Shared meanings flowed from these collaborations and allowed students to develop better products. This has been suggested by Moller (1998) as well, who observed that groups have been found to outperform individual members of the learning community in higher-order thinking activities such as problem-solving and critical thinking.

Interactions occurred between pairs and groups of students, as well as between students and instructors, and between students and course content (Hewitt, 2000; Kearsley, 2000). Graham (2002) suggests that there are group skills that underlie the interactions of individuals that affect the effectiveness of the group. These include decision-making, consensus-building, dealing with conflict, basic communication skills, and trust. This is not a comprehensive list, yet it does provide an indication of the types of skills that enhance interactions in group situations. Because this was a graduate course and a number of the students knew some of their colleagues previously, possible challenges that might have arisen in terms of interacting with one another did not. Learners in this study demonstrated skill in making decisions and building consensus as a group (although the process took longer than it would have in a face-to-face situation). With a larger class, or with learners who did not know each other in advance, course instructors would need to consider carefully the needs of the group regarding skills in interacting in the online environment.

Participation was an integral component of the course. This commitment to frequent participation and communication is critical in learning in online environments (Hill, 2001; Lock, 2002). Learners were expected to participate in the online discussion and in the work of the groups consistently. Learners reported that they felt compelled to go online and communicate with their peers, as well as read what their colleagues had posted. Those learners who experienced the constructivist orientation as a major shift initially found it more difficult to post messages online. Several learners reported that they began to write all their notes in a word-processor so that they could use spell check and also reflect on the content of the note before they posted it. This preference continued throughout the course for these learners, although by the conclusion of the course they had developed a more relaxed attitude toward posting messages in the online environment. However, whether learners worked directly online or through copying and pasting text from a word-processor, a focus on frequent participation in the communications in Knowledge Forum was evident and was viewed as a benefit of work in the course.

The participants in this study learned to work within a framework of communication, collaboration, interaction, and participation in their on line course. They adopted a constructivist approach to learning, which required them to communicate appropriately, work collaboratively, interact effectively, and participate frequently in their learning environment. This learning, although intense work, brought unexpected rewards to the learners in terms of their perceptions of self-efficacy and their plans for future use of online technologies in their personal and professional lives.

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