The Effects of a Synchronous Communication Tool (Yahoo Messenger) on Online Learners' Sense of Community and their Multimedia Authoring Skills

Shiang-Kwei Wang
New York Institute of Technology, New York

Abstract

Literature suggests that developing a community of learners is the key to a successful online-learning experience. In this study, the instructor of a multimedia authoring course adopted a synchronous communication tool (Yahoo Messenger) to interact with learners orally on a weekly basis and, thereby, to establish a sense among the learners that the class was a learning community. This study adopts mixed-methodology (the Classroom Community Scale, open-ended questions, and grades) to compare the learners' development of a sense of community with both the outcomes of the learners' group-centered online learning and the outcomes of the learners' group-centered face-to-face learning. The results indicate that in neither of the two groups did a sense of community contribute to the improvement of hands-on skills. Providing clear instruction with constant and accurate feedback is the key strategy by which instructors can help online learners improve their hands-on performance.

Introduction

Hands-on skills are essential to learners in the field of instructional technology. They need to possess certain levels of production skills in order to manifest the desired training and learning outcomes. Because of the advancement of new technologies, schools have gradually offered more and more online courses that require hands-on skills and that cover, for example, multimedia authoring and web-page design. Therefore, the efficiency and the effectiveness of online learning has become a study focus. To ensure online-learning success, educators and researchers have been studying the importance of developing a sense of community in an online-learning environment. This study investigates both the effects that the use of a synchronous communication tool has on the learners' development of a sense of community and the relationship between learners' sense of community and learning outcomes.

Literature Review

Sense of Community in Online Environments

The advancement of computer technology and the prevalence of network connections have helped to gradually shift learning settings from the face-to-face classroom to the online-learning environment. In the latter setting, learners interact with the instructor and with other learners through computer-mediated communication (CMC) technologies, including asynchronous and synchronous communication tools. Here, the lack of natural social interaction causes "feelings of isolation," which have become a major challenge for online educators (Caldwell & Taha, 1993; Morgan & Tam, 1999; Weller, 2007). Research findings support the assertion that online learners' completion rate is lower than traditional face-to-face learners' completion rate (Diaz, 2002; Frankola, 2001; Keith, 2006). One possible solution to this problem is to build a sense of community in the online-learning environment—a community in which learners support each

other and feel connected with other learners (Hill & Raven, 2000; Lally & Barrett, 1999; Misanchuk & Anderson, 2001).

McMillan and Chavis (1986) define the notion of a sense of community as "a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together" (p. 9). A member in a particular community has a feeling of belonging to the community and has a desire to support other members. Educators have been exploring ways to establish this type of atmosphere in online-learning environments to overcome learners' feelings of isolation that stem, in particular, from geographical distance or from temporal difference. A strong sense of online community can strengthen information exchange, learning support, commitment to group goals, collaboration, and satisfaction with group efforts (Palloff & Pratt, 1999; Romiszowski & Mason, 2004; Rovai, 2001; Rovai & Wighting, 2005). Research has identified effective strategies that promote a sense of online-learning community and that the author discusses in the following section.

Strategies to Promote a Sense of Community in Online-learning Environments

Studies have shown that the key to a successful online class is to develop a strong sense of community between learners and the instructor. A sense of community is linked to learners' greater satisfaction with their academic program and to reduced feelings of isolation (Rovai, 2002). Kowch and Schwier (1997) stated that a successful virtual learning community must permit the following conditions among members: negotiation, intimacy, commitment, and engagement. Thus, many studies that suggest strategies by which educators can improve a sense of online community integrate these four conditions into the strategies. Below are some of these:

- Develop learning communities: instructors could develop learning communities by assigning team work, by facilitating collaboration (Palloff & Pratt, 2001, p. 138), or by encouraging cooperative learning (Lally & Barrett, 1999).
- Emphasize human elements of community: instructors could use strategies that help learners acknowledge or be aware of others' presence and identity, and these strategies include establishing user profiles or acknowledging members individually (Brook & Oliver, 2002; Dueber & Misanchuk, 2001).
- Manage the flow of online classes: instructors in an online-learning environment should encourage participation, discussion, and collaboration, and should set clear directions (Brook & Oliver, 2003; Collins & Berge, 1996).
- Encourage communication through synchronous interaction: Instructors could adopt synchronous technology that provides learners with real-time interaction experience, which is missing from the asynchronous communication environment. Several studies provided evidence that real-time text-based discussion tools facilitate learners' collaborative-learning experiences and learners' development of a sense of a learning community (Duemer et al., 2002; Motteram, 2001; Schwier & Balbar, 2002).

In addition to these strategies, emerging technologies (e.g., handheld devices) and various course designs might strengthen learners' sense of online community. Educators need a reliable instrument to identify the effects that these factors have on online learners' sense of community.

Measure the Sense of Community in Online-learning Environments

To help educators both perceive the value of an online sense of community and identify strategies that best promote the formation of community, Rovai (2002) developed and validated

the Classroom Community Scale (CCS) to measure graduate students' sense of learning community. Many studies adopted the CCS to measure the sense of online community. For instance, Graff (2003) adopted the CCS to study the relationship between cognitive style and sense of community; using the CCS, Shea (2006) perceived that teaching presence is associated with learners' sense of community in an online environment; using the CCS to examine the sense of community that existed between African American learners and Caucasian learners, Rovai and Ponton (2005) reported that the scores of the African American learners were significantly lower than those of the Caucasian learners; and Dawson (2006), using the CCS to investigate the relationship between the quantity of discussion forum postings and learners' sense of community, found that learner-instructor social interaction, rather than the quantity of forum postings, was an adequate indicator of community development. These studies verified the validity of the CCS and successfully identified relationships between learners' online community and various factors. Encouraged by these studies, I followed a similar research design. I adopted the CCS to measure, for this study, the effects that the use of a synchronous communication tool would have on online learners' sense of community, and whether the tool has an effect on their learning performance.

Learning Multimedia Authoring Skills in Online Environments

In a typical educational technology program, multimedia authoring is a required computer-skills course that, because it involves hands-on practice, includes lab sessions. Learners need to follow the instructor's demonstrations, finish the assigned projects, have them reviewed by the instructor, and then discuss difficulties and solutions with classmates. Therefore, frequent instructor-learner and learner-learner interactions take place in this type of course. With the shift to the online-learning environment, the task of teaching multimedia authoring has become a huge challenge for instructors. In the face-to-face learning environment, the instructor can correct learners immediately and can verify that they are following the directions. It is, however, comparatively difficult for the instructor to ensure that learners follow the hands-on training in an online-learning environment. This difficulty arises when there is considerable geographical distance or considerable temporal difference between the instructor and the learners. Because of these two factors, many learners feel frustrated when, after encountering project-design problems, a face-to-face meeting with an instructor or with another learner is impractical. Thus, developing a stronger sense of community in an online environment might promote online learners' continued learning of hands-on skills. It is relatively more difficult to create, maintain, and foster a sense of community in an online course than it is to do so in a face-to-face course. Therefore, the purpose of this study is to investigate whether or not a synchronous communication tool improves the interactions among an instructor and learners—which is to say, a sense of online community. The hypothesis is that, with the assistance of the synchronous communication tool, the online group and the face-to-face group will have a similar sense of learning community and similar learning outcomes. The following research questions guided this study:

- Can a synchronous communication tool establish a sense of an online-learning community similar to the sense of community in a face-to-face learning environment?
- Is there a correlation between the online group chat-session attendance and the learners' learning of hands-on skills?
- Is there a correlation between a sense of an online-learning community and learners' learning performance?

Research Design

As DiPetta (1998) mentioned, "Experiences in virtual environments are like snowflakes—no two are alike" (p. 62). In this regard, my intention is to describe the learning environment thoroughly. In this study, I am the researcher in addition to my role as the course instructor. I explore both the learning processes and the learning activities of the two groups of participants rather than generalize the findings; therefore, educators can decide the extent to which they wish to apply my findings to their own contexts (Merriam, 1995). I adopted mixed-methodology (Tashakkori & Teddlie, 1998) to collect both qualitative data (group chat-session records, learners' projects, and the instructor's observation notes) and quantitative data (surveys, grades). By using data collected from multiple methods, I triangulated the findings (Mathison, 1988).

Participants

Participants belonged to one of two groups of learners. The learners had enrolled in a multimedia authoring course in an instructional-technology graduate program at a university located in the northeastern United States. I selected them according to the purposive-sampling method. Group 1 consisted of 18 learners who were taking the online version of the course, and Group 2 consisted of 8 learners who were taking the face-to-face version of the course. Most of the learners were in-service teachers who had acquired little or no multimedia authoring knowledge before taking this class.

Learning Environments

In this study, a synchronous communication tool (Yahoo Messenger) functioned as a supplemental tool for the online instruction because at the time it was the only tool that enables real-time and two-way oral and video communication among multiple participants. Participants in the chat room could communicate via text and oral conversation. Ten participants were already using Yahoo messenger so I instructed the rest of the participants to register a Yahoo account for messenger installation. I did not adopt the chat tool in Blackboard because it does not offer oral or video communication function. I implemented the synchronous communication tool in the online version of the course during eight 1-hour group chat sessions. The group chat sessions constituted a forum where learners could discuss project-design difficulties, could discuss multimedia authoring skills, and could respond to one another's questions. Learners' participation in the synchronous chat sessions was voluntary.

While media's effectiveness relative to learning is still under debate (Clark, 1991; Kozma, 1994), the present study reflects my effort to determine two main relationships: first, the extent to which a synchronous communication tool can improve online learners' sense of community, and second, the relationships that exist between learners' sense of community and their learning performance. I expected that the two groups of learners would demonstrate similar learning-performance outcomes and would have similar senses of community.

I selected Adobe Flash® (Flash) for its flexibility in relation to animation and interactivity. At each group's first session, the instructor would introduce learners to the concept of multimedia authoring and would explain the process by which the learners would complete the required multimedia projects. Learners started using Flash after Week 3. They needed to learn how to use drawing tools to create animated objects, how to use timeline tools to design keyframe animation, and how to use actionscript to design simple interactivity (e.g., rollover button, hyperlink, drag-and-drop activity, interactive assessment). I used Adobe Captivate® to

record the Flash-use procedure. Then, I uploaded the streaming video to Blackboard so that the two groups of learners could observe the demonstration repeatedly at their own pace. The effect of using streaming video to facilitate learning hands-on skills in online environments was reported in Wang's (2006) article.

Each group of learners received the same instruction as did the other group. There were only two differences: the online group met in group chat sessions eight times whereas the face-to-face group met 12 times; and the online group asked questions and received clarification through a synchronous communication tool whereas the face-to-face group asked questions and received clarifications at any time during the classroom sessions. In both the online group and the face-to-face group, every learner was assigned a design buddy so that the pair could monitor each other's learning progress and could provide each other with suggestions. Learners were required to interact with their design buddies at least once a week by providing feedback and suggestions to their projects, including needs analysis, topic selection, flowchart, interface design, and pilot programs. Some advanced learners actively helped their design buddies to debug in Flash. The abovementioned activities were mediated through Blackboard in online environment for the online group; and they occurred both face-to-face and online for the face-to-face group.

In addition to my use of chat sessions for the online group, I adopted several other strategies by which to promote a sense of an online-learning community. For instance, as the instructor, I encouraged learners to introduce themselves, assigned a design buddy to each learner, required learners to respond to other learners' projects, and sent emails to learners who might encounter difficulties.

Data Collection and Analysis

I collected data from the following sources to measure both the online learners' experience of using the synchronous communication tool and both groups of learners' learning performance.

Classroom Community Scale (CCS). The CCS, developed by Rovai (2002), is an instrument that helps assess both learners' sense of community and the extent of community development, as I mentioned earlier. The CCS contains 20 five-point Likert-scaled items, 10 items each for the subscales of social community and learning community. I slightly revised the CCS (see Appendix A) and administrated it at the end of the semester in the two classes. Participants who never attended synchronous group chat sessions were excluded from the survey. Following the advice of Rovai and Wighting (2005), I reverse-scored the item ranking to ensure that the least favorable choice would correspond to 0 and that the most favorable choice would correspond to 4. I accumulated the scores on each subscale. The total scores ranged from 0 to 40, with higher scores reflecting a stronger sense of community.

CCS independent *sample t-test*. I conducted an independent-samples t-test to determine whether or not there was a significant difference either between Group 1's learning performance and Group 2's learning performance or between Group 1's sense of community and Group 2's sense of community.

CCS correlation between factors. I used a correlational design to determine (1) whether or not the frequency with which online learners attended synchronous communication sessions was related to their grades and (2) whether or not Group 1's community subscales were related to Group 1's grades and whether or not Group 2's community subscales were related to Group 2's grades.

Open-ended questions (see Appendix B). I analyzed open-ended questions by using the constant comparative method (Bogdan & Biklen, 1998). I read the responses and the comments

several times and then generated a list of emerging themes.

Grades (learning performance). Learners' multimedia projects were evaluated in terms of instructional components, instructional design, interactivity design, interface-and-navigation design, multimedia elements production, and aesthetics. A project that met all requirements received an A (range from 90 to 100); a project that met partial requirements received a B (range from 80-89) or a C (range from 70-79).

Limitations

This study focused on a specific domain relating to online graduate students' efforts to learn procedural knowledge (multimedia authoring skills). The results were not generalizable to other domains or to other type of learners. The sample sizes of the two groups were unequal and might affect the statistical analysis results of the independent samples t-test.

Results

Analysis of the CCS Independent samples t-test. I conducted descriptive statistics to display: (1) learners' sense of community (social community, learning community, and total sense of community), (2) the frequency with which online learners attended synchronous group chat sessions, and (3) grades. Table 1 summarizes general descriptive statistics. I conducted an independent samples t-test to compare the online group's sense of community with the face-to-face group's sense of community and to compare the online group's learning performance with the face-to-face group's learning performance. The data in Table 1 indicate a significant difference between online learners' social-community score and face-to-face learners' social-community score ($t(18)=2.43$, $p<.05$) and between online learners' total-sense-of-community score face-to-face learners' total-sense-of-community score ($t(18)=2.13$, $p<.05$). No significant difference was found between online participants' grades and face-to-face participants' grades (learning performance). The results suggest that the face-to-face learners' sense of community was stronger than the online learners' sense of community.

Table 1

Descriptive statistics for sense-of-community variables and the independent samples t-test analysis of learners' grades and of learners' sense of community (by group)

	Online (Synchronous chat group) N=14		Face-to-face group N=6				Rovai (2002) Online group N=375	Dawson (2006) Online group N=441	Shea (2006) Online group N=2314
	M	S.D.	M	S.D.	T	Sig.	M	M	M
Social community	20.7	6.3	27.5	3.8	2.43	**.026***	26.5	20.2	24.1
Learning community	27.3	7.2	32.0	3.0	1.52	.145	30.2	26.0	29.2
Community *	48.0	12.4	59.5	6.6	2.13	**.047***	56.6	46.2	53.4
Grades	91.0	3.6	86.7	10.1	-1.44	.166			
Online-chat-session attendance (out of 8)	6.6	1.4							

*Community equals the sum of social community and learning community. Community scores range from 0 to 80.
*Significant at the .05 level

To offset the potential errors caused by the unequal sample sizes, I compared each group's sense of community with the related findings of previous research (Dawson, 2006; Rovai, 2002; Shea, 2006) to determine whether or not a great difference exists between my findings and previous findings. Online learners' sense of community was lower than Rovai's report and Shea's report, while face-to-face learners' sense of community was higher than their respective reports. However, online learners' sense of community was similar to Dawson's report. Face-to-face learners' sense of community was higher than the reports in each of the three bodies of previous research. Therefore, use of a synchronous communication tool did not successfully develop a similar sense of community in the face-to-face learning environment. According to the present study, the face-to-face learning environment is the most appropriate model with which to develop classroom community.

Correlation between online-chat-session attendance and online learners' grades. Table 2 presents the results of a Pearson correlation analysis on the frequencies of online learners' synchronous-communication-session attendance, online learners' grades, and two sets of classroom-community subscales. Of the 18 online learners, 14 participated in the synchronous chat sessions. Based on the Pearson correlation coefficients, the results did not support the hypothesis that use of a synchronous communication tool can develop online learners' sense of community. Neither the learning-community scores nor the social-community scores were related to the frequency with which online learners attended the chat sessions (r=.156 and r=.189, respectively). However, the frequency at which online learners attended chat sessions was significantly related to the learners' grades (r=.626, p<.05). Online learners who attended more chat sessions tended to have higher grades. One explanation is that learners who are concerned about their academic performance also tend to participate in activities organized by the instructor.

Table 2
Pearson correlations of online learners' grades, frequencies of attendance at synchronous communication sessions, and two subscales of classroom community (N=14)

	Grades	Frequencies of chat-session attendance (out of 8)	Learning community	Social community
Grades	-			
Frequencies of chat-session attendance (out of 8)	.626*	-		
Learning community	.174	.156	-	
Social community	.202	.189	.669*	-

*Significant at the .05 level (2-tailed)

Correlation between grades and sense of community. Table 3 presents the Pearson correlation analysis on learning formats (online vs. face-to-face), the two classroom-community subscales, and grades. The results indicate that in both learning environments, learners' learning performance was not related to the sense of community (r=.02).

Table 3
Pearson correlations of two subscales of classroom community, grades, and groups (N=20)

	Group (1=f2f; 2=online)	Grade	Learning community	Social community	Community
Group	-				
Grade	.32	-			
Learning community	-.34	.03	-		
Social community	-.50*	.005	.73*	-	
Community	-.45*	.02	.93*	.93*	-

*Significant at the .05 level (2-tailed)

Analysis of Open-ended Questions

1. Reasons for learners' success or learners' failure in this class

Open-ended questions provide further descriptions that help explain learners' perception of sense of community and learners' learning experiences. The two groups of learners were asked to identify reasons for their success or failure in the class. Table 4 lists their responses by number of learners reported.

Table 4
Learners' perception of reasons for success or failure in this class

Face-to-face learners	
Reasons for success	**Number of times reported**
Received immediate help from instructor and peers	3
Interested in learning multimedia authoring	2
Reasons for failure	**Number of times reported**
Poor time management	4
Multimedia authoring is difficult	1
Online learners	
Reasons for success	**Number of times reported**
Instructor's constant and quick feedback	6
Design buddy's feedback	3
Self-determination to practice constantly	3
Streaming animation is easy to follow	2
Reasons for failure	**Number of times reported**
Difficult to learn hands-on skills in online environment	4
Multimedia authoring is difficult	1

Learners in each group identified that the main reason for their success was to receive accurate feedback from the instructor or peers. In the online-learning environment, once learners posted their in-progress projects, I (acting as the instructor) reviewed them and provided suggestions in fewer than 2 days. The design buddy was required to respond to his or her partner so that each learner received feedback at least from both the instructor and one learner in the online environment. Sometimes the face-to-face learners stayed at the lab almost an hour after the class

was over so that they could help each other to resolve problems encountered during the design process. The following comments substantiate the importance of feedback for both the online learners and the face-to-face learners:

- "I succeeded due to the 'family' of my fellow classmates. My professor was very knowledgeable about the content, and answered all questions to the best of her ability."
- "I succeeded due to the feedback received from my professor, design buddies, and professional colleagues at work, which allowed me to enhance the quality of my project."
- "I succeeded because I had great direction from the instructor. The instructor is very thorough in her delivery of information. She uses all her resources well, moreover creating a great avenue for us to learn."

Some online learners pointed out that learning hands-on skills is difficult in online environments because the nature of the task requires learners to observe the hands-on demonstration and to receive immediate feedback if they have questions. Poor time management was the main reason that face-to-face learners identified regarding their failure in this class.

2. How the synchronous communication tool contributed to learning.

Although the CCS survey indicates that use of the synchronous communication tool did not leverage the sense of community of online learners to the same level of face-to-face learners, online learners acknowledged that the tool served a purpose in open-ended questions. The effect of chat tool on online learners' sense of community might be clearer if CCS surveys are administered in two groups of online learners, one uses chat tool while the other does not. Synchronous communication provides a channel through which learners can receive immediate responses that clarify questions or correct mistakes. In this regard, the tool is a more effective communication method than are discussion boards, which entail 2 or 3 days between the posting of a question or a statement and the posted response. Further, learners admitted that they would not check all messages on the discussion board, so the learners might neglect some useful information effectively hidden in these postings. In short, with a synchronous chat session, it is easier to spread information to most learners than to do so with posts on a discussion board. The group chat session gives everyone a chance to openly express concerns, questions, and suggestions, as one learner noted:

- "I participated in almost all the Yahoo sessions, and it provided me with insight as to what others were doing in their projects, and several people had some of the same difficulties I had. Yahoo made it easier for the professor to clarify issues instantaneously."

The group chat sessions helped acquaint the learners with the instructor and with one another because they could hear the oral conversation and see the graphic avatar of many other learners. The tool we chose (Yahoo) is affordable and easy to use. Through the oral conversation, learners could get information about the class expectations, especially from other learners' questions. And on a foundational level, whether emotional or philosophical, the tool promoted a sense of community insofar as learners could *feel* the *existence* of other learners and the *existence* of the instructor. Indeed, many learners pointed out that their chat-session attendance reminded them of regular-classroom attendance. A consensus emerged: the learners believed that, in general, a synchronous communication tool is more appropriate for information that one finds, for example, during office hours and that, in general, an asynchronous communication tool is more appropriate for information that requires significant time for the framing of in-depth questions and in-depth responses. This result is consistent with the investigation conducted by Branon and Essex (2001).

3. Disadvantages of using the synchronous communication tool

Learners who used the synchronous communication tool discovered that a single learner's technical issues could interrupt an oral conversation. All other learners had to wait for the

instructor to help this particular learner. Even though learners were instructed to test their own network connection and their own audio device, occasional technical problems occurred during the group chat sessions. The instructor and other learners had to type the question and the response in the message window, an outcome that detracted from the value of oral conversation. Also, not everyone could attend all sessions because it was difficult to find a time suitable for all learners. Some learners tended to dominate proceedings or to ask questions whose answers were readily available elsewhere, including on the discussion board. And text messages tangled with one another if learners raised too many questions at once.

4. How the synchronous communication tool contributed to the development of a sense of community

About half the learners believed that the synchronous communication tool contributed to the development of their sense of a learning community. Several learners used the synchronous communication tool (Yahoo) outside the regular chat sessions. These learners discussed materials with their design buddies, and some discussed assignments with other learners. A few of them established conversation topics beyond class learning. The rest of the learners attended the chat sessions mainly because they did not want to miss important information, not because the sessions provided these particular learners with a sense of community. During each 1-hour chat session, most of the interaction took place between the instructor and the learners. It was difficult to promote learners-learners interaction. Ng (2007) reported a similar finding: synchronous learning promotes interaction between the instructor and an individual learner rather than interaction among learners.

Discussion

The primary aim of this study was to determine whether or not—and if so, how—the use of a synchronous communication tool would be related to a set of two classroom-community variables and would be related to the learners' learning of hands-on skills. The literature-review section suggests that, in online-learning environments, a stronger sense of community not only can reduce learners' feelings of isolation but also can strengthen learners' satisfaction with the learning experiences therein. This study addresses the role that synchronous communication tools play in developing a sense of community in online-learning environments. The focus, here, is on hands-on skills, which the relevant literature rarely mentions. This study's collection and analysis of the data yield answers to each of the three research questions.

(1) Can a synchronous communication tool establish a sense of an online-learning community similar to the sense of community in a face-to-face learning environment?

The independent samples t-test indicates that face-to-face learners had a stronger sense of community than the online learners had. The use of a synchronous communication tool did not establish a sense of community similar to that in a face-to-face environment. The results of open-ended questions reveal that online learners recognized the value of the synchronous communication tool insofar as the tool enabled the learners to accomplish tasks almost immediately: for example, to ask questions, to articulate problems, to receive feedback, and to receive instructions. This immediacy gave learners the impression, also, that they were attending a class similar to a regular class. In a domain focusing on procedural knowledge, learners benefit, in general, from constant practice and from quick and accurate feedback, whether from the instructor or peers. Regarding this study's course, the conceptual-knowledge exchange existed only during the first few sessions, when learners and the instructor discussed the importance of multimedia-program production, the instructional design process, and evaluations of one

another's choice of multimedia projects. Thereafter, learners had to spend most of their time working on their own projects rather than communicate or discuss ideas with peers. Even though the instructor incorporated a synchronous communication tool into the online course in order to facilitate the development of a sense of community, the tool did not meet learners' needs perhaps the task required highly independent efforts.

(2) Is there a correlation between the online group chat-session attendance and the learners' learning of hands-on skills?

The results of the Pearson correlation coefficient indicate that the frequency with which online learners attended chat sessions related not to the development of a sense of community but to grades. However, the relationship between frequency and grades was likely not a cause-and-effect one. Learners who exhibited a higher learning performance tended to participate in most classroom-related activities. The results of open-ended questions show that learners attributed their learning outcome to two factors: ability to receive feedback from the instructor and peers and constant practice. The function of the synchronous communication chat sessions served as regular office hours.

(3) Is there a correlation between a sense of an online-learning community and learners' learning performance?

The Pearson correlation analysis suggests that in both the face-to-face learning environment and the online-learning environment, learners' learning performance was not related to the learners' sense of community. As explained in the above sections, learners' development of hands-on skills rested on practice and accurate feedback from the instructor or peers.

Implications

Hands-on skills are important in the field of instructional technology. Similar learning domains include office-application operations (word processing, presentation, spreadsheet, database), web-page design, graphic design, non-linear video editing, audio-video production, and programming skills. Schools are offering more and more courses that address these skills and that take place in online environments. This study suggests that learners' sense of a learning community is not the major cause of learners' development of hands-on skills; however, instructors of these types of courses should adopt strategies that ensure each online learner's successful learning experience. Instructors who provide fast, accurate, constant feedback and clear directions are fulfilling one of the most important conditions that help online learners improve hands-on skills. An instructor could use a synchronous communication tool to host regular office hours, in which learners could participate voluntarily. Last but not least, each learner should have opportunities to work with at least one other learner: together, they can monitor each other's learning progress.

References

Branon, R. F., & Essex, C. (2001). Synchronous and asynchronous communication tools in distance education: A survey of instructors. *TechTrends*, *45*(1), 36-42.

Brook, C., & Oliver, R. (2002). Supporting the development of learning communities in online settings. Paper presented at the ED-MEDIA 2002 World Conference on Educational Multimedia, Hypermedia & Telecommunications, Colorado. Retrieved July 5, 2007, from http://eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED476977

Brook C., & Oliver, R. (2003). Online learning communities: Investigating a design framework. *Australian Journal of Educational Technology*, *19*(2), 139-160. Retrieved May 22, 2007, from http://www.ascilite.org.au/ajet/ajet19/brook.html

Caldwell, B. S., & Taha, L. H. (1993). Starving at the banquet: Social isolation in electronic communication media. *Interpersonal computing and technology: an electronic journal for the 21st century*, *1*(1). Retrieved July 3, 2007, from http://www.infomotions.com/serials/ipct/ipct-v1n01-caldwell-starving.txt

Clark, R. E. (1991). When researchers swim upstream: Reflections on an unpopular argument about learning from media. *Educational Technology*, *31*(1), 34-40

Collins, M., & Berge, Z. (1996). Facilitating interaction in computer mediated online courses. Paper presented the FSU/AECT Distance Education Conference, Tallahassee, Florida. Retrieved May 23, 2007, from http://www.emoderators.com/moderators/flcc.html

Diaz, D. P. (2002). Online drop rates revisited. *The Technology Source*, May/June. Retrieved May 2, 2007, from http://technologysource.org/article/online_drop_rates_revisited/

DiPetta, T. (1998). Community on-line: New professional environments for higher education. *New Directions for Teaching and Learning*, *76*, 53-66.

Dawson, S. (2006). Online forum discussion interactions as an indicator of student community. *Australasian Journal of Educational Technology*, *22*(4), 495-510. Retrieved May 1, 2007, from http://www.ascilite.org.au/ajet/ajet22/dawson.html

Due, B., & Misanchuk, M. (2001). Sense of community in a distance education course. *Proceedings of the Annual Mid-South Instructional Technology Conference*, Murfreesboro, Tennessee. Retrieved June 12, 2007, from http://billdueber.com/dueber-misanchuk.pdf

Frankola, K. (2001). Why online learners dropout. *Workforce*, October, 53-63. Retrieved April 2, 2007, from http://findarticles.com/p/articles/mi_m0FXS/is_10_80/ai_79352432

Graff, M. (2003). Individual differences in sense of classroom community in a blended learning environment. *Learning, Media and Technology*, *2*8(2), 203-210.

Hill, J. R., & Raven, A. (2000). Online learning communities: If you build them, will they stay*?* *Instructional Technology Forum*, Retrieved April 2, 2007, from http://it.coe.uga.edu/itforum/paper46/paper46.htm

Howch, E., & Schwier, R. (1997). Considerations in the construction of technology-base virtual learning communities. *Canadian Journal of Educational Communication*, *26*(1), 1-12.

Keith, T.-S. (2006). Early Attrition among first time eLearners: A review of factors that contribute to drop-out, withdrawal and non-completion rates of adult learners undertaking eLearning Programmes. *Journal of Online Learning and Teaching*, *2*(2), Retrieved July 11, 2007, from http://jolt.merlot.org/Vol2_No2_TylerSmith.htm

Kozma, R. B. (1994). Will media influence learning? Reframing the debate. *Educational Technology Research and Development*, *42*(2), 7-19.

Lally. V., & Barrett, E. (1999). Building a learning community online: Towards socio-academic interaction. *Research Papers in Education*, *14*(2), 147-163.

Mathison, S. (1988). Why triangulate? *Educational Researchers*, *17*(2), 13-17.

Merriam, S. B. (1995). What can you tell from an N of 1?: Issues of validity and reliability in qualitative research. *PAACE Journal of Lifelong Learning*, *4*, 51-60.

McMillan, D. W., & Chavis, D. M. (1986). Sense of community: a definition and theory. *Journal of Community Psychology*, *14*(1), 6-23.

Misanchuk, M., & Anderson, T. (2001). Building community in an online learning environment: Communication, cooperation and collaboration. *Proceedings of the Annual Mid-South Instructional Technology Conference*, Murfreesboro, Tennessee. Retrieved June 22, 2007, from http://www.mtsu.edu/~itconf/proceed01/19.html

Morgan, C. K., & Tam. M. (1999). Unravelling the complexities of distance education student attribution. *Distance Education*, *20*(1), 96-108.

Motteram, G. (2001). The role of synchronous communication in fully distance education. *Australian Journal of Educational Technology*, *17*(2), 131-149. Retrieved June 11, 2007, from http://www.ascilite.org.au/ajet/ajet17/motteram.html

Ng, K. C. (2007). Replacing face-to-face tutorials by synchronous online technologies: Challenges and pedagogical implications. *International Review of Research in Open and Distance Learning*, *8*(1), Retrieved July 12, 2007 from http://www.irrodl.org/index.php/irrodl/article/view/335/776

Palloff, R. M., & Pratt, K. (2001). *Lessons from the cyberspace classroom: The realities of online teaching*. San Francisco: Jossey-Bass.

Romiszowski, A., & Mason, R. (2004). Computer-mediated communication. In D. H. Jonassen. (Ed.), *Handbook of research for educational communications and technology* (pp. 397-431). (2nd ed.). New York: Simon & Schuster Macmillan.

Rovai, A. P. (2001). Building classroom community at a distance: A case study. *Educational Technology Research & Development*, *49*(4). 33-48.

Rovai, A. P. (2002). Development of an instrument to measure classroom community. *Internet and Higher Education*, *5*(3), 197–211.

Rovai, A. P., & Ponton, M. K. (2005). An examination of sense of classroom community and learning among African American and Caucasian graduate students. *Journal of Asynchronous Learning Networks*, *10*(1). Retrieved July 14, 2007 from http://www.sloan-c.org/publications/jaln/v9n3/v9n3_rovai.asp

Rovai, A. P., & Wighting, M. J. (2005). Feelings of alienation and community among higher education students in a virtual classroom. *Internet and Higher Education*, *8*, 97-110.

Schwier, R. A., & Balbar, S. (2002). The interplay of content and community in synchronous and asynchronous communication: Virtual communication in a graduate seminar. *Canadian Journal of Learning and Technology*, *28*(2), Retrieved May 7, 2007, from http://www.cjlt.ca/content/vol28.2/schwier_balbar.html

Shea, P. (2006). A study of students' sense of learning community in online environments. *Journal of Asynchronous Learning Networks*, *10*(1). Retrieved July 14, 2007, from http://www.sloan-c.org/publications/JALN/v10n1/v10n1_4shea.asp

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches.* Thousand Oaks, CA: Sage.

Wang, S.-K. (2005). Hybrid or total online? In P. L. Rogers. (Ed.), *The Encyclopedia of Distance Learning: Vol. 5*. (pp. 1856-1862). Hershey, PennsylvaniaIdea: Group.

Wang, S.-K. (2006). Learning Hands-on Skills in an Online Environment: The Effectiveness of

Streaming Demonstration Animation, *Journal of Online Interactive Learning*, *5*(1), available online: [http://www.ncolr.org/jiol/issues/viewarticle.cfm?volID=5&IssueID=16&ArticleID=74]

Weller, M. (2007). The distance from isolation: Why communities are the logical conclusion in e-learning. *Computers & Education*, *49*, 148-159.

Appendix A
Classroom Community Scale (Rovai, 2002)

Strongly agree (SA), Agree (A), Neutral (N), Disagree (D), Strongly Disagree (SD)

1. I feel that students in this course care about each other. (SA)(A)(N)(D)(SD)
2. I feel that I am encouraged to ask questions. (SA)(A)(N)(D)(SD)
3. I feel connected to others in this course. (SA)(A)(N)(D)(SD)
4. I feel that it is hard to get help when I have a question. (SA)(A)(N)(D)(SD)
5. I do not feel a spirit of community. (SA)(A)(N)(D)(SD)
6. I feel that I receive timely feedback. (SA)(A)(N)(D)(SD)
7. I feel that this course is like a family. (SA)(A)(N)(D)(SD)
8. I feel uneasy exposing gaps in my understanding. (SA)(A)(N)(D)(SD)
9. I feel isolated in this course. (SA)(A)(N)(D)(SD)
10. I feel reluctant to speak openly. (SA)(A)(N)(D)(SD)
11. I trust others in this course. (SA)(A)(N)(D)(SD)
12. I feel that this course results in only modest learning. (SA)(A)(N)(D)(SD)
13. I feel that I can rely on others in this course. (SA)(A)(N)(D)(SD)
14. I feel that other students do not help me learn. (SA)(A)(N)(D)(SD)
15. I feel that members of this course depend on me. (SA)(A)(N)(D)(SD)
16. I feel that I am given ample opportunities to learn. (SA)(A)(N)(D)(SD)
17. I feel uncertain about others in this course. (SA)(A)(N)(D)(SD)
18. I feel that my educational needs are not being met(SA)(A)(N)(D)(SD)
19. I feel confident that others will support me. (SA)(A)(N)(D)(SD)
20. I feel that this course does not promote a desire to learn. (SA)(A)(N)(D)(SD)

Appendix B
Open-ended questions for online group

1. How important is the synchronous interaction in a web-based course that emphasizes hands-on skills like those needed for multimedia authoring?
2. What is the value of the synchronous tool we used in this class in comparison with the value of an asynchronous tool such as Blackboard?
3. What was your experience with synchronous interaction this semester?
4. Regarding your classmates in this course, did you use the synchronous tool to chat with them beyond the designated chat sessions? If so, how was your experience?
5. Do you think that, in comparison with using only Blackboard, using the synchronous tool helped you develop a sense of belonging to this online community?
6. What were the pros and cons of using the synchronous tool in this class?
7. Compared to other online courses you took before, what difference did using the synchronous tool make in terms of both interaction and a sense of belonging to this class?
8. How could the instructor improve this type of chatting session in the future?