Fostering Creativity through Cross-Disciplinary Collaboration in an Online Dance Course

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Abstract: This paper examines cross-disciplinary collaboration in an online dance course in the School for the Contemporary Arts, Simon Fraser University. The course was delivered entirely online through the Lohn Lab, Centre for Distance Education at SFU. Students were from both the Faculty of Arts and the Faculty of Applied Sciences, which allowed for cross-disciplinary collaborative work. Most course tasks required the students to create unique human figure animations using Life Forms 3-D human figure animation software and give aesthetic critiques on the work of others. To investigate how online collaborative tasks may foster creativity, we analyzed conference transcripts, interviews, and questionnaires. Transcript analysis showed that students actively collaborated. The message exchange also revealed that the environment functioned well as a means of promoting student-centered collaboration. The insight and creativity in using Life Forms that the non-dance students contributed helped dance students free themselves from their established conceptions of dance pedagogy and aesthetics. Issues that hindered collaboration were mostly related to students' particular preferences and software problems (downloading/uploading time). The majority of students interviewed supported the online collaborative Life Forms assignment tasks, but some were negative about collaborative assignments.

Keywords: best practices, computer-mediated communication, qualitative methods

Introduction: Online collaboration and knowledge building

> *The space of cyberspace is a construction, an architecture in which, seemingly, an operator can transfer its agency to a puppet, in a time and context governed by different rules than those of the "real" external world. It permits an interactivity that denies the body at the same time it stimulates it (Milthorp, 1996, p.141).*

In our traditional educational system, students learn mainly through individualized work, following instructions given by a professor in a classroom lecture. Students undertake assigned tasks such as reading, doing library research, and completing exercises. Then they are examined to ensure they have acquired the knowledge. More recently instructors have been experimenting with collaborative learning, particularly in online environments

(Harasim, 1993; Koschman, Kelson, Feltovich & Barrows, 1996; Wang & Teles, 1998). One consistent finding has been that online courses differ from the face-to-face classroom in terms of the amount of student participation in the learning process.

For our purposes, collaboration may be defined as the collective discovery and acquisition of a body of knowledge. In a more restrictive definition, a collaborative project is one that reflects the cumulative contributions of a selected group of class members rather than a product of any one individual.

In the online classroom, collaborative learning implies the use of instructional methods that involve group efforts among students working on a particular course task. The asynchronicity (not real time) of the online classroom allows for extended peer and instructional interactions. These environments can facilitate exploration and knowledge building (Scardamalia & Bereiter, 1996), and they have been used to implement innovative learning approaches such as teleapprenticeship (Teles, 1994), role playing (Wang & Teles, 1998), and problem solving (Campos, 1998).

The traditional classroom by its nature emphasizes individual progress and the accomplishment of goals mentored and monitored by the instructor. Online pedagogical strategies, on the other hand, are based upon the collective wisdom of class members as they work together in a variety of ways, guided by the instructor, to explore the material relevant to the course objectives.

To explore whether the method of course delivery and the collaborative model facilitated the achievement of course objective, we were interested in such questions as: 1) Did students collaborate in the online course? If so, how did they collaborate? If not, what factors hindered collaboration? 2) What are the students' attitudes towards online collaboration? and 3) How did the students' cross-disciplinary collaboration foster creativity?

Methodology

Course description

"Dancing in Cyberspace: Creating with the Virtual Body" is an undergraduate credit course in the School of Contemporary Arts, Faculty of Arts, Simon Fraser University. The course is delivered entirely online and uses a groupware for course delivery called Virtual-U and the Life Forms software for creating human figure animations. Both programs were developed at Simon Fraser University. Iris Garland (the first author) taught the section of the course studied for this research.

First taught in 1997 as a special topics course developed by Iris Garland and Lisa Marie Naugle, the course attracted dance students and a selected number of dance professionals from the U.S., Spain, France, and elsewhere in Canada, who took the course under special audit arrangements (Garland & Naugle, 1998). Twenty-five students originally registered for the second offering of Dancing in Cyberspace in 1998, and the 20 who completed the course were SFU students with a wide range of majors, including dance,

visual arts, film, computer science, business, engineering, and communications. There were no prerequisites for the course. In this context, the term cross-disciplinary refers to the mixed student population. While some of the students from majors other than dance had experienced formal dance training, many had not studied dance previously. The students without dance experience were interested in learning a 3-D animation computer software program and in working in an online environment with an asynchronous time schedule.

Students used home computers and a modem or the university computer labs to access the course and their peers. When they registered for the course, students received a package containing course material: a Study Guide that included week-by-week course information, a Course Reader containing photocopied reading materials, an I.D. and password for the Virtual-U classroom, and a copy of Life Forms software and manual. The Life Forms software has been used internationally by choreographers, dance educators, architects, and professional animators.

During the course period, semi-structured compositional assignments gradually introduced the complexities of creating animations with Life Forms. For example, the first assignment consisted of creating four postures, or key frames, that utilize the simple elements of editing (creating body movements), the Timeline (sequence of key frames), and playback in the Stage window where the Life Forms figures can be viewed in the animated sequence. The structure of the assignments became less restrictive and students began to collaborate with other class members in partner assignments as they mastered the software program. Life Forms animation assignments were uploaded to the class in the Virtual-U online classroom. Students could download, view, and comment upon other class members' animations using an upload/download feature that allowed for file exchange. Students uploaded and downloaded Life Forms files and then ran them with software installed in their own computers or in campus labs.

The course had several electronic lectures (short presentations prepared by the instructor, which included questions for students to address in online discussions with other class members). Reading assignments and online discussion about aesthetic and sociological issues of human body representation in cyberspace were also part of the course requirements.

Data sources

Qualitative and quantitative methods were used to investigate data from four sources: usage statistics tracking class participation, transcripts of online course discussions, interviews with selected students, and instructor's observations of the online classroom..

Coding criteria for transcript analysis

Conference messages were analyzed manually to identify patterns of interactions among the participants. Analysis of all the conference messages would have been desirable, but time constraints made doing so impossible. Therefore, two topic-related conferences from different times in the course were chosen for analysis. Topic 1 ("Navigating Through Life

Forms") was discussed in the first conference in the course and Topic 6 ("Theatre as Cyberspace") was discussed mid-way through the course. Both conferences involved discussions of readings.

Five categories of messages were defined to capture the patterns of interactions in online discussions: 1) students' responses to course topics, 2) student to student messages, 3) student to instructor messages, 4) instructor's responses to students, and 5) instructor's assignments/comments. The following is a brief description of the criteria for the classification of the messages.

1. Students' responses to course topics

Messages in this category were students' responses to the topic assignments (representing person-content interaction). They were generally the required postings for the weekly discussion and were mostly aimed at the whole class or group, including the instructors. These messages were not directed to a particular student or participant.

2. Student to student messages

Messages of this category were directed from one student to another (indicating interpersonal interaction). The identification was based on the direct mention of the name(s) of the student(s) in the text or in the heading of the message. The content of the message further helped to confirm the classification. These messages were usually comments on an earlier message by another student. They were the most interactive in nature, and the exchange of messages among peers often continued for a few rounds. They were, however, all coded in this category whether the response to an earlier message was first, second, or even third round.

3. Students to instructor messages

These were students' messages directed to the instructor. They included the first round of messages initiated by the students to the instructor and students' replies to particular messages by the instructor in the discussion.

4. Instructor's responses to students

The instructor's replies to student questions and comments on students' earlier messages fall into this category (indicating interpersonal interaction). They include the instructor's comments on a particular student's earlier message (direct mention of the name of the student). The instructor's responses to students' questions were also coded in this category. These messages by the instructor were not initiated by the instructor but by earlier messages sent by an individual student.

5. Instructor's assignments/comments

These messages refer either to the instructor's introduction to the topics of the weekly discussion or to the summaries of the topic discussion. Sometimes they were assignments or explanations of the assignments.

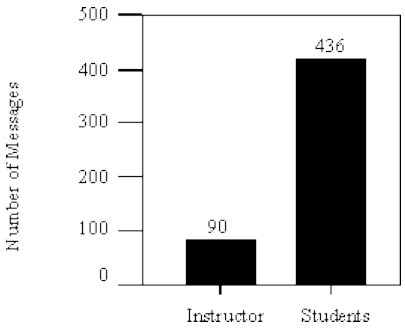
It is important to note that the unit for coding was the message. Thus, a message may have multiple functions, but it was counted only once in one of the five categories above. The judgment was based on the main function of the message as suggested by the heading and the context. For example, a message that was a student reply to an earlier student question or comment and was directed to that particular student might also bring in or refer to other students or the instructor. It was still counted only once as the category of "student to student message" based on the main function of this message.

Results

Conference participation

The students and the instructor posted a substantial number of messages in the conferences during the course. This number does not include the course-related email messages between the instructor, tutor-marker, and students. The total number of conference messages in the Virtual-U generated by the students and instructor is shown in Figure 1.

Figure 1. Total Number of Messages by the Instructor and Students



Transcript analysis: Identifying online collaboration in conference discussions

The primary aim of the transcript analysis was to identify and explore two levels of interaction: interaction with course content and interpersonal interaction. Interaction with course content was characterized by student responses to the required readings and to lectures or assignments posted by the instructor (category 1). Interpersonal interaction included the dynamics of student collaboration (categories 2, 3, and 4), which is the most important part of the interaction online.

In the conference of Topic 1, for example, there was a very successful discussion on the parallels between drama and human-computer interaction. Students interacted with the course content rather than with other students at the start of the conference; student's first round of messages were their reactions to the readings. The interpersonal level of communication was prompted by the instructor, who sent out a request for students to make comments on other students' postings. The students then posted agreements and disagreements with other students' ideas and began to negotiate meanings and collaborate

on more complex answers and understandings. Some students' messages elicited a few rounds of comments from many students pushing the discussion forward and giving it depth.

Results of the analysis of the analyzed conferences are presented in Table 1.

Table 1. Five Categories of Messages Indicating Patterns of

Interactions in Two Topic Discussion Conferences

Message Type	Conferences	
	Topic 1	Topic 6
Students' response to the topics	24	47
Student to student responses	42	50
Student to instructor responses	1	0
Instructor's response to students	1	6
Instructor's assignments/comments	1	1
Total	69	104

Instructor observations and student interviews

The instructor’s observations and student interviews focused on the impact of collaborative tasks and the cross-disciplinary student population on the online learning environment.

Reactions to collaborative online assignments

The mutual feedback/critiques of classmates' animations in online postings in the Virtual-U conferences proved to be a highly successful learning strategy. Because the feedback/critique was a text message that was accessible online for every class member to read, think about, and comment upon during an entire week, the postings needed to be substantive and have more profound resonance than similar student feedback in a face-to-face tutorial. Critiquing online had to be monitored carefully by the instructor, and guidelines were established to ensure that the comments were useful, constructive, and substantive. Students were graded on the quantity and quality of their posted messages in response to each other's work. The class organization into dyads and teams made it possible for each student to be critiqued by other classmates. Furthermore, assigned team partners were rotated so that students had new input from different class members for each assignment. The cross-disciplinary nature of the class served to extend the aesthetic approaches to the animations. Computer expertise in the form of shortcuts and personal discoveries were also shared.

Student involvement in viewing the animations of class members exceeded the course requirements. They were required to view only about a third of the animation assignments for each week, and teams with a maximum of nine class members were established in the conferences for this purpose. The instructor's intention was to reduce the student workload. However, reading privileges in all groups (access to downloading animations and reading the critiques) were extended to the entire class, and a number of students viewed and commented upon animations that were in groups other than their own. The team approach created a sense of cooperation and personal responsibility that was a motivating factor in completing assignments by the deadlines. Class members apologized in their messages if their assignments or responses were late.

The instructor did not directly enter into the critiquing/feedback process in the first few animation assignments. This strategy was used to encourage the class members to take responsibility immediately for responding to one another and to prevent the instructor’s comments from either leading or inhibiting the discussion. This practice is contrary to what one would expect in a face-to-face setting. Twice during the semester the instructor posted animation critiques for each member of the class. The intention was to provide the instructor's feedback on individual progress, offer critical suggestions that would benefit the entire class, and stimulate students who were not challenging themselves sufficiently. These critiques were supplemental personal messages that were exchanged by the instructor and individual students by email.

Class members appeared to accept and respect the responsibility for contributing to one another's progress in the animation assignments. Tact and maturity in constructive criticism and appreciative reception of feedback was apparent in most of the posted messages in the conferences.

Reactions to the collaborative activity were not all positive. For example, in some of the collaborative activities, each animator had to build on or incorporate the individual contributions of their partners. Generally, students seemed to enjoy this aspect of the course, but a few students felt thwarted creatively when they were forced to adapt or compromise their own ideas in the service of someone else's contribution. With this assignment structure, the final product was jeopardized by the weakest link. The advantage of this method of collaboration is that students had to consider and interpret the intentions of their collaborators and make an appropriate creative response that developed and extended their original ideas. In the most successful solutions, new ideas and skills were generated that might not otherwise have occurred. After the course, nine students (about half of the total who completed the course) responded to the interview request. During the individual interviews, they were asked about their response to their collaboration on the tasks of building on the peers' animations to complete the whole assignments. The responses are presented in Table 2.

Table 2. Students Responses to the Question "Did you find the use of dyads in the Life Forms animation assignments helpful to your learning?"

Students	Major	Helpful?	Reasons/Comments
Student 1	undecided	Depends	learn only from better partners
Student 2	Visual Art	No	more freedom to work on my own
Student 3	undecided	No	does not benefit from other new users
Student 4	biology	Yes	challenge, learned from others
Student 5	engineering	No	do not understand others' points
Student 6	computer	No	limitation on my own creativity
Student 7	dance	Yes	excellent way of discover new features
Student 8	dance	Yes	second person learned form the first person
Student 9	communications	Yes	collaboration

Students' attitude toward collaborative tasks seemed to be influenced by collaborative task type, students' learning habits, and difference in intellectual and skill levels. While almost all the students interviewed agreed that they benefited from participating in the online discussions of the reading topics, half of them (4 out of 9) did not give positive responses to the task of building on a peer's half-finished animation to complete the assignment. There are various reasons for this difference in attitude toward collaboration. One explanation arises from the nature of the collaboration online. Open-ended comments that are a part of a discussion are different from small group or pair work on something that will result in a real product to be submitted for a grade. Dance students enjoyed the collaborative animation assignments, whereas visual art, engineering, and computer students preferred working with their own creative stimuli. The biology student was a dance minor. The collaborative animations required students to complete their section of the assignment and then send their animation to the next person on the team to build on the narrative of the animation with their own contribution. Some students were late with their sections, which caused the other team members considerable anxiety.

For the Topic discussions students were required to make comments on peers' messages and give constructive feedback. The discussions did not place limits on students as they aired their views or made constructive comments. Students brought up new issues and widened their views. Agreement did not have to be reached, although ideas were often shared.

In collaborative tasks that resulted in an assignment that would be marked, students were advantaged, or disadvantaged, by the skill of their partner(s) and their own sensitivity in perceiving the intention of their partner(s). The instructor observed that some individuals with clear, creative vision were not interested in compromising their ideas for a collective endeavor.

Working habits and personality also influenced students' attitude towards collaboration. Some students were stimulated creatively by the input of others because it opened new avenues of discovery and challenged habitual patterns.

In the collaborative process used in this course, the instructor initially had some trepidation about a course structure where individual rights of authorship were not upheld in the strictest sense. However, the wave of the future and the creative workplace of today seems to be a creative collaborative environment of sharing one's work and building toward a common goal. The collaborative online tasks in this course proved to be successful and effective in achieving the course objectives.

2. Learning in a cross-disciplinary online classroom

The instructor's observations and student interview data revealed that the quality of the animation assignments, both technically and creatively, was significantly better in the cross-disciplinary offering than it was when the course was primarily offered to dance students the previous Spring. We believe there are three reasons for this difference, and they are discussed below.

First, students who were not in the Dance program were generally more computer literate, and they developed skill with the Life Forms 3-D software program at a faster rate than the majority of dance students. Although the dance students probably had more technical knowledge of body mechanics and a facility with creative movement of the "real" body, manipulating the "virtual" body required computer skills and intuition that superseded kinesthetic awareness, at least at the beginning stages of the learning process. In many cases, non-dance students were more accurate in simulating appropriate body part relationships than dance students. This apparent difference may have been the result of their facility in copying/pasting sequences from the Life Forms Animations library into their own animations. But students with more computer knowledge were also more adventuresome and fluid in the rhythm of movements on the timeline that determines the flow of the animated sequence. As one student commented: "The students from computer engineering knew how to ground a figure and they knew what to do with a figure to make it really life like, whereas we [dance students] were much more carried away with getting it leaping around the stage a bit... They were actually much better in this course, and actually creating figures that were doing real things."

Second, the creative process was determined more by the possibilities inherent in the Life Forms computer software program than by the human limitations of the "real" body. Students who had no expectations of transferring the Life Forms animations to live bodies in the "real" studio or on stage were particularly imaginative in their solutions to creative problems. As one of the dance students put it, "They [engineering students] have the technical knowledge whereas we were much more concentrated on the [real life] movements."

The course supervisor and the tutor-marker based their judgments of creativity on the following criteria, about which the students were informed: 1) Did the animation clearly express (represent) a concept, idea, mood, or feeling?, 2) Was the technical skill with the

Life Forms program sufficient to manifest the idea of the animation?, and 3) Did the animation reveal something new and different for the student? In other words, what new challenges were attempted, and how successfully were they fulfilled?

The students in areas outside of dance brought new perspectives to the Life Forms animation assignments from their own respective disciplines and movement activities. They were more oriented to the 3-D possibilities in the numerous options available in the Life Forms program, including the multiple perspectives of Top, Bottom, Front, Back, Side and the tilting, rotating, elevation, and size of the Figure(s) and Stage in the space. In other words, they conceived their animations as an independent art form, rather than as isolated dance movement sequences.

Thirdly, using the Life Forms software developed students' skills in the use of choreographic principles, and students who were not in the Dance program were able to create interesting and aesthetically satisfying animations utilizing its features.

The class showed progress in generating expressive ideas for their animation assignments and developed their thematic seeds using the tools available in the Life Forms Program. Such choreographic devices as repetition, variation of movement, canon, and phrasing were incorporated into assignments, although these were not taught as choreographic principles.

It is unlikely that the students outside the Dance program would register in a traditional studio dance choreography course. Such courses generally have dance prerequisites that would exclude them. One clear benefit of the online course is that it offered an opportunity for a wider segment of the student population to engage in expressive body representation, and students were exposed to an aspect of choreography and aesthetics not otherwise available to them.

Students physically unable to dance were able to dance vicariously. One student was recovering from an ankle injury. During the first offering, another student was pregnant. The online instructor observed (via online interaction and email messaging) that the dance students benefited from the fresh perspectives of students from other disciplines who were not encumbered with preconceptions from previous dance pedagogy and aesthetics.

Summary and conclusions

"Dancing in Cyberspace" was developed to provide students with a collaborative online experience to support them in learning how to use Life Forms software to create artistic animations of the human body. Students actively collaborated in the online course as is shown by the transcript analysis. The message exchanges demonstrated that the environment functioned as a student-centered collaborative classroom. The insight and creativity in using the Life Forms program that students from disciplines outside of dance contributed helped the dance students to free themselves from predetermined conceptions of previous dance pedagogy and aesthetics.

Issues that hindered collaboration were related to students' particular preferences and software problems (downloading/uploading time). The majority of students supported the online collaborative Life Forms assignment tasks, but some were negative about collaborative animation assignments in which their artistic ideas had to be adapted to a group effort.

This research suggests directions for future research and practice of computer-supported collaborative learning environments. The online nature of this course attracted persons typically not attracted to fine arts courses. Many universities (including SFU) have breadth requirements to encourage students to expose themselves to a variety of views of the world; the successful marriage of computer science and dance in an online setting demonstrates the wisdom of such requirements. Cross-disciplinary student collaboration fostered student creativity as the knowledge of each group of students were combined to create animations that tested and went beyond the assumptions of both. The data suggested that students who are majoring in dance generally found it beneficial in tasks such as building on peers' animation to complete a joint assignment. They felt that working with students from other disciplines, especially peers from computer science and engineering, broadened their view of Life Forms animations. The students from disciplines outside of dance created aesthetically satisfying Life Forms animations and learned some principles of dance choreography. The success of this marriage should encourage other instructors to design courses that will cross disciplinary boundaries and encourage collaboration both in the smaller sense of students working together, and the larger sense of disciplines working together.

This study also generates a number of research questions regarding collaborative online environments. In this study, student perspectives on their online experience differed by student background (dance versus computer science) and task characteristics (graded versus non-graded). More studies on the impact and interaction of student and task characteristics on online collaboration would be useful to explore these dynamics further. In addition, our findings suggest that instructional prompts and encouragement increased and shaped student contributions to the collaborative environment. The role of the instructor in structuring and enhancing online collaboration clearly deserves more study.

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