

The Use of Desktop Video Conferencing as a Medium for Collaboration Between Beginning Instructional Designers and Intern Teachers

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In this pilot study the collaborative efforts by way of desktop video conferencing between beginning instructional designers and intern teachers was investigated. The impact of a real-world context for designing instruction on beginning instructional designers was examined and a unique opportunity for intern teachers to experience the process of instructional design was provided. Data collection consisted of questionnaires, journals, and observations. These two groups, with similar missions, rarely have the opportunity to work together face-to-face because of time and space constraints. The cooperative venture designed provided a first step in determining whether virtual collaboration through desktop video conferencing provided an effective means for enabling such an experience. Results suggest that, despite severe communicative and interactive limitations due to technical deficiencies, participants value the process and developed professionally as a result.

As the 21st century begins, nearly all public schools in the United States are online (Department of Education, 1997). It is important that teachers understand the effective use of the technology that will soon be as commonplace in the schools as a blackboard or an overhead projector. A renewed commitment to innovative approaches that support the development of beginning teachers must emanate from the university and college level to ensure that teachers are equipped to teach in technology-enhanced environments. Many technology infusion efforts in teacher education, however, have not focused adequately on the use of networked technologies to broaden time and space boundaries and to enable enhanced learning environments (Chizmar & Williams, 1996). In education as a whole, technological innovations are often driven more by technology than theory—resulting in environments catered more to extolling the virtue of the tool than to addressing the instructional need it has been designed to solve. (Koschmann, Kelson, Feltovich, & Barrows, 1996). Lack of insight into the nature of technology-based learning occasionally leaves one with a less than effective means of encouraging and supporting developing teachers' abilities to use technology effectively during their initial classroom endeavors.

In many ways, the preparation of beginning instructional designers has been hindered as well by an over-emphasis on technological processes. Using technology to support developing designers gain practical knowledge grounded in sound theoretical understandings is perhaps more likely to be successful when the use is more "transparent." *Transparent* technologies are convenient, accessible, familiar, enable meaningful communication and interaction otherwise unavailable, and allow the focus to lie on the content of the communication, rather than on the technology that enables it (Nonis, Bronack, & Heaton, 2000). Using technology to connect designers to real-world design situations, for example, may provide an opportunity otherwise unavailable for developing skills in designing instruction that are often lacking. Authentic situations are important to developing designers because instructional design work in ill-structured and unpredictable contexts, and must have experience considering multiple points of view (Kovalchick, Hrabe, Julian, & Kinzie, 1998).

Collaboration

Desktop video conferencing (DVC), provides an opportunity for collaborators at different locations to interact with one another on various types of projects in meaningful ways. During a remote meeting, collaborators may share documents, brainstorm, or compare visualizations using an

electronic whiteboard. They can share and edit documents in real-time. The tools that enable such collaborations are relatively cheap and accessible. As a result, desktop video conferencing as a means of synchronous communication is becoming a reasonable option for providing meaningful learning experiences for students.

While DVC can be used as a virtual lecture hall, it may have more meaningful potential as a way to make learning more global and collaborative. Collaborative approaches supported by technologies such as DVC may enhance the learning process through emphasis on group interaction (Harasim, 1990; Bonk & King, 1998). Further, technology-based collaboration may facilitate problem-solving and higher order thinking skills development in ways traditionally unavailable (Van Dusen, 1997), through learner-centered approaches that are personally meaningful and socially negotiated (Wagner & Combs, 1995).

Authentic Tasks

When collaborative learning efforts are based on real world or authentic contexts, the meaningfulness and purposefulness of the task can make the results particularly rewarding (Bonk & Cunningham, 1998). For example, Todd (1996) described a series of desktop videoconferences between a New Zealand student, temporarily living in the US, and some of her countrymen back home. The project ended with news shows and classroom collaboration between American and New Zealand students as well as health education activities presented by medical doctors in New Zealand. Cifuentes, Beller, and Portela (1999) described a theme-based unit between schools using DVC to simulate a space shuttle mission. One classroom served as mission control center, while the other classroom acted as the shuttle crew. The students interacted by way of DVC to accomplish actual space mission tasks—including recording blood pressure data. Not only did the students interact by way of DVC, the teachers used DVC for technical support.

While these students could likely have learned about health and space missions through conventional means and in a non-collaborative atmosphere, the interaction provided more than just the facts. Unplanned, serendipitous learning of social mores, culture, weather, and language, for example, are an added benefit of authentic, real world learning and are integral to ideal learning environments where both subject engagement and interaction exist. For some, providing subject matter that engages students—and ample opportunity for interaction between peers—is a pedagogical shift from

teacher-centered to learner-centered and not merely another teaching strategy. Learner-centered, constructivist online learning environments often take more time and effort and a very different kind of classroom control on the part of a teacher. Collaborative projects using DVC may serve as one way to provide both collaboration and authenticity. However, as a learning technology, the actual usefulness of DVC is still unclear.

All That Glitters is not Gold

The use of DVC technology is not without problems from both hardware and interpersonal communication perspectives (e.g., Heath & Luff, 1992; O'Conaill, Whittaker & Wilbur, 1993). Bandwidth and processing speed are common concerns that often impact the quality of the communication between participants. Additionally, lack of immediate non-verbal feedback may inhibit collaborative efforts (Heath & Luff, 1992). Collaborative conflicts within DVC situations, therefore, are likely to be compounded. Despite the apparent problems with DVC, does it remain a viable means for instructional collaboration? A pilot study to begin to answer this question was conducted.

PURPOSE

In this pilot study the collaborative efforts between beginning educational technology students and intern teachers through desktop video conferencing was investigated. The impact of a real-world context for designing instruction on beginning instructional designers' ability to consider multiple points of view was examined and appropriate courses of action were proposed. In addition, the collaboration provided a unique experience for intern teachers, who generally do not experience the process of instructional design or the application of technology in the design and development of relevant learning activities. These two groups, with similar missions, rarely have the opportunity to work together face-to-face because of time and access constraints. The collaborative venture we designed provided a first step in determining whether virtual collaboration through DVC provides an effective means for enabling such an experience.

METHOD

A total of four students participated in this study: two from educational technology and two from teacher education. Each was paired with a partner from the other program, resulting in two ID-Intern teams. Each team was charged with creating an instructional lesson for use in the intern's current classroom. The interns completed two seven-week placements and the teams were switched during the transition. Consequently, each designer paired with each intern to produce two separate designs over the course of 14 weeks. The two teams (one instructional designer and one intern teacher) met between two and four times for each dyad pairing. Consequently, each designer paired with each intern to produce two separate designs over the course of 14 weeks. The design activities included units on: molecules, bats, Shay's rebellion, and spelling the word *Pennsylvania*. The computer-based 3-D animated molecule lesson demonstrated the makeup of water and carbon while the other computer-based lesson included pictures, text, and links about bats. Additionally, a play about Shay's rebellion was created for students to act out. Finally, a mnemonic device was created to help young learners spell Pennsylvania.

The participants received equipment and training on the use of the equipment as well as help installing it on their computers. The participants also received guidelines for completing their projects, as well as a suggested timetable for completion. The DVC equipment consisted of three Quick-Camä cameras, one Videumä camera, 58K modems, and external microphones. *NetMeetingä* was used as the communication software. *NetMeetingä* is a free Microsoftä product with chat, whiteboard, and document sharing capabilities in addition to real-time video and audio.

Participants' satisfaction with the collaborative process was assessed by journal entries and a questionnaire submitted by each participant after each collaborative session. The journals provided insight into the interns' changing perceptions of the instructional design process and the meaningful application of technology. The questionnaire included questions that addressed the collaborative process as well as the video conferencing medium. Items on the questionnaire were grouped into the following categories: (a) professionalism, (b) communication, and (c) media. Data were collected on each dyad throughout the semester through the questionnaires and the journal entries from both the instructional designers and the preservice teachers. Finally, the researchers observed two meetings and recorded any problems or issues not covered in the journal or questionnaire.

The data was analyzed using quantitative and qualitative procedures and triangulated through the questionnaires, journals, and observations. Questionnaire responses were evaluated and judged on whether or not the participants' perceived value of the instructional design process was affected by the collaboration in any way. An analytic induction approach (Krathwhol, 1993; Denzin & Lincoln, 1994) was used to analyze the journals: Commonalties or regularities within the data sets were derived from an iterative question and answer cycle. The observations were used to support or refute the findings.

RESULTS

Each participant provided multiple responses to the pilot study questionnaire. The questionnaire used a five-point Likert scale—moving from Strongly Disagree to Strongly Agree—concerning statements about professional behavior, communication, and media. For the final questionnaire, two additional items were added, to provide a global measure of the perceived project value. The individual items are shown in Table 1.

Table 1
Questionnaire Statements According to Factor

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|--|
| <p>Professionalism:</p> <ul style="list-style-type: none"> ● I have enjoyed working with my colleague ● I have benefited from working in this collaborative partnership <p>Communication:</p> <ul style="list-style-type: none"> ● Based on my experiences, the use of desktop video conferencing enables meaningful communication ● Based on my experiences, the use of desktop video conferencing enables interaction that would be difficult via any other media <p>Media:</p> <ul style="list-style-type: none"> ● Desktop video conferencing is a useful medium for collaboration Based on my experiences, desktop video conferencing is easy to use Based on my experiences, the use of desktop video conferencing allows me to focus on the design process, rather than on the technology <p>Global Measures:</p> <ul style="list-style-type: none"> Overall, I valued my experience with this virtual collaborative project I would recommend this virtual collaborative process to a colleague |
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The results of the participant evaluations, according to dyad, are represented in Table 2.

Table 2
Participant Evaluation of Experience—by Dyad

| Factor | Dyad 1 Mean (SD) | Dyad 2 Mean (SD) | Dyad 3 Mean (SD) | Dyad 4 Mean (SD) | Overall Mean (SD) |
|------------------------|---------------------|---------------------|---------------------|---------------------|----------------------|
| Professionalism | 4.00(.75) | 2.75(.95) | 4.06(.17) | 4.33(.51) | 3.90(.77) |
| Communication | 3.00(.39) | 3.16(.33) | 2.87(.30) | 3.22(.34) | 3.03(.35) |
| Media | 2.95(.45) | 3.25(.91) | 2.54(.56) | 3.27(.64) | 2.94(.65) |
| Experience | — | — | 4.50(.70) | 3.50(.70) | 4.00(.81) |
| Recommend | — | — | 2.00(.00) | 3.50(.70) | 2.75(.95) |

Table 3 represents the questionnaire results according to group membership—that is, instructional designers’ perceptions versus intern teachers’.

Table 3
Participant Evaluation of Experience—Teachers versus Designers

| Factor | Intern Teachers Mean (SD) | Instructional Designers Mean (SD) | Overall Mean (SD) |
|------------------------|---------------------------------|---|----------------------|
| Professionalism | 4.06(.17) | 4.33(.51) | 3.90(.77) |
| Communication | 2.87(.30) | 3.22(.34) | 3.03(.35) |
| Media | 2.54(.56) | 3.27(.64) | 2.94(.65) |

It is important to note that, given the small number of participants and the exploratory nature of this initial study, the results must be viewed as prefatory, at best. Further data are necessary before any true effect may be measured. However, the results of this pilot study may serve as a guide for future work in this area.

DISCUSSION

The purpose of this pilot study was to determine the viability of authentic collaboration between novice instructional designers and intern teachers through DVC. Providing an opportunity for such a project would contribute to gaining practical experience for both types of novices who likely do not have the opportunity to meet because of time and distance. In addition, authentic environments provide richness and serendipitous learning that is

usually not a part of a contrived situation. From this real-world environment, the instructional designers had the opportunity to consider multiple points of view and appropriate courses of action. The intern teachers experienced the process of instructional design and the application of technology in the design and development of relevant learning activities.

One major goal of this pilot project was to stimulate participants' consideration of multiple points of view and contemplation of appropriate courses of action. Initial data suggest this goal was met. Data also suggest that the participants valued the authentic environments that fostered collaboration. The participants were also frustrated by the hardware problems that hindered their interaction. While poor audio was the most troubling aspect, poor video also contributed to frustration with the delivery system.

Multiple Points of View and Proposed Course of Action

In general, the process between the teams was one where the intern teachers shared the subjects they would be covering in their classes and the instructional designers conducted a needs assessment. For example, one instructional designer had a list of questions prepared for the intern teacher:

1. Tell me about your students; their ethnic demographic, the grade, how many, etc.
2. Are they slow/average/advanced?
3. What are their reading skills? Can you provide examples of the level?
4. How much freedom,/latitude in your class with your students?
5. Tell me about the available technology

The designer asked the teacher to describe: "what an average day in your classroom looks like. [I] wanted her to paint a picture so I could best visualize the milieu."

While these pictures were provided in three of the four cases, there was, according to one designer a lack of communication between him and one of the intern teachers:

I wanted her to talk more about a need, some void in her class that she was having trouble filling or rectifying. She never really touched on anything like this though. Perhaps this is a result of her being new at teaching, a novice in an atmosphere where she is finding her feet. Granted. But it leaves me a little in a lurch. How do I proceed?

The instructional designer's course of action in this case was to re-search the two topics that the intern teacher had indicated she was teaching. He then developed a stand-alone lesson that could be used as the intern teacher saw fit. Struggling with the format of the lesson and difficulty in determining an engaging lesson was another opportunity for the designers to consider multiple points of view and appropriate outcomes:

I am having a difficult time designing instruction for this topic. To me it seems very elementary and simple, therefore making it hard to break down and explain. I am also finding it difficult to present the material in an interesting and problematic way instead of simply announcing the facts to the class.

The makeup of the students and the learning outcomes also provided opportunities for the designers to consider multiple points of view. For example, the varying reading levels of six-year-old students needed to be considered when developing a unit on bats. Additionally, the "instructional implications" also needed to be considered against an information processing model. For example, was the outcome to be *conceptual understanding* or *declarative knowledge acquisition*?

The instructional designers considered a variety of options—based upon the intern teacher's requirements and the ability of the students—for delivering the final products. For example, considering student attention span and their ability to memorize was a consideration with the play project:

[the intern teacher] told me that memorization would probably be out but that her students could hold copies of the play and improvise from their familiarity with the events, a result of ongoing instruction in Social Studies. That was a good sign. I asked her too about their attention span. Would they be bored by something that took twenty minutes to get through. She said she did not think that would be any problem at all with her group. I was reassured.

For the computer-based projects, the available hardware needed to be taken into consideration:

We also discussed computer availability and specs. [The intern teacher] has 3 Macs in her classroom and access to a lab of Macs. The lab is not large enough to accommodate all students (29 in all), so if the project is developed for a computer, students will work in teams or will be split into groups. Computers in the lab have CD-ROMs and Internet access.

This pilot study provided many opportunities for the instructional design students to be creative in planning and providing solutions. For example, as with all collaborative efforts, speaking the same language is important. One designer pointed out that a compatible format should be designed that fulfills both an ID document and a lesson plan:

In order to create accurate communication between the instructional designer and the teacher, perhaps we need to develop a format that is compatible to both parties. In addition, this common format would avoid redundancy and save valuable time. Another solution to this dilemma may be for the instructional designer to create a document similar to a lesson plan. After all, as instructional designers, we should be providing teachers with a product that is in a usable format.

To remedy this situation, the designer used document-sharing so that she and the intern teacher could work simultaneously on the design document.

While the instructional designers had a range of possibilities for developing a lesson, they had to consider real world constraints such as time, available technology, and the kinds of situations mentioned above. Working around the various constraints, the products created during this pilot study were diverse. The ID participants had a vested interest in the instructional lessons that were developed. Unfortunately, on two occasions, the intern teachers were unable to use the lessons in their class due to time constraints and other problems. This left the instructional designers disappointed and feeling a sense of incompleteness.

Intern Teachers Experiencing ID Process

The goal was to provide a unique experience for intern teachers, who generally do not experience the process of instructional design or the application of technology in the design and development of relevant learning activities. This collaborative effort provided such an experience and the data suggests that this outcome was met.

Initially, the roles of the ID students and the intern teachers needed to be made clear. The intern teachers were, according to the instructional designers, unclear about their role in this process and both instructional designers felt that they had to explain the process. One instructional designer put it this way:

I do not think that [the intern teacher] had a clear understanding of the role of an instructional designer. At this point, I think she was under the impression that I would decide on a topic for the project. [The intern teacher] described to me the subjects she covers with her students. For our next meeting, I asked [the intern teacher] to determine what type of instruction would be helpful in her classroom.

Additionally, the intern teachers did not seem to have a real stake in the outcome. For example, one intern teacher described the process of deciding on an activity as follows:

I explained to [the designer] that *if he comes up with something* (italics added) the children are expected to work on independently, it shouldn't be text-dependent at all, because the reading levels of some of these kids are pretty low.

Or

[the designer] shared *her* (italics added) lesson again through document sharing.

Also during the first projects, the intern teachers did not embrace a lesson that deviated from the textbook:

We talked a bit about ideas for a lesson. It's going to be difficult because in second grade everything follows the book. It's hard to diverge. Also, spelling, math and reading are the only subjects we do everyday. Social studies and science are only a once or twice a week, at most.

During the second half of the study, the intern teachers seemed to feel more ownership and value the ID process and product. The intern teachers were the subject matter experts, describing to the instructional designers lesson content, classroom dynamics, and feedback on the developing lesson. As noted in this excerpt from an intern teacher's journal during the second pairing:

"We (italics added) concluded that developing a lesson on social studies would be the best idea." And: "I told [the designer] the easiest thing for *us* to work on together would probably be science."

Additionally, during the second half of the study, the intern teachers were open to including the lesson in their teaching. "My last day of teaching is a week away so we decided I would have the students do the play on

Wednesday or Thursday. Sounds good! And: “What [the designer] has come up with sounds like a great idea that will be a nice complement to my unit.”

In addition to having a better understanding of their role value and the ID process, the intern teachers understood the role of technology: “There are a lot of different ways in which my unit could be enhanced using technology in an *authentic and, meaningful way*, not just using it to use it.” Being involved in an authentic project provided the intern teachers with experience and understanding of the instructional design process.

Use of DVC

Is DVC an effective means for enabling virtual collaboration? In the case of this study, the collaborative projects were completed in spite of the technology. There were both video and audio problems during the study that inhibited the process. Lack of audio was the most frustrating component for the participants. While video offered the ability for the teams to see each other, audio was obviously essential. As one designer described:

The technology was not a big problem until about midway through the meeting video was very slow and choppy for the duration of the meeting, and toward the end of the meeting, the audio I was sending was so delayed that we had to use the chat function to communicate. It was taking about 10-15 seconds for my audio to reach [the intern teacher]. I was able to hear her perfectly.

And:

Tonight’s videoconference was frustrating for several reasons. At first, communication was relatively easy. We were able to hear and see each other clearly. However, the audio became increasingly delayed as the meeting went on until it was impossible to communicate using audio. We then paused video transmission, which helped audio quality somewhat, but it again became increasingly delayed. (Is there some kind of buffer that is getting full and not clearing out?)

Although the participants used the chat feature when audio failed, chat was cumbersome. One of the participants wrote that she left out details during the discussion because chat was too laborious for detailed explanations. “We finally ended up using the chat function to communicate. This tool was obviously not intended for use in meaningful conversation. I hate typing what I want to say, and I end up leaving out most of my thoughts for the sake of speed.”

While the chat feature was not valued, the document-sharing feature was highly praised. According to one intern teacher:

I thought document sharing was so neat! I can see how this would be a very helpful tool in planning lessons. For example, if you wanted to share a lesson with someone in California, it would be much faster and easier to do it through document sharing. Mailing the lesson would take too long and both mailing and faxing doesn't allow two people to correct the lesson together and share comments. After the person received the mail or fax, they would have to chat about it over the phone. Using document sharing, the two people can take control of the mouse and correct things right there.

and from one instructional designer's journal:

A valuable tool of desktop video conferencing, which was a great asset to this meeting, was document-sharing. We were able to discuss the document I wrote for the project without faxing, e-mailing, or mailing the text. When I opened and shared the file, [the intern teacher] was able to read it and make changes accordingly. Despite the technical difficulties and frustrations, we both enjoyed the document-sharing feature and have progressed in our project.

In spite of the technical problems associated with DVC, the participants valued the opportunity for collaboration and participation in the development of a useful product.

CONCLUSION

As Bonk and King (1998) suggested quality of learning can be enhanced through learner-centered, interactive situations that require critical thinking. This particular pilot study provided such an experience for the participants. The instructional design participants had opportunities to view tasks from multiple perspectives and determining an appropriate course of action. The intern teachers participated in the instructional design process, which resulted in an increased understanding of a systematic method for producing instructional materials.

DVC provided a means for communication between the participants that likely would not have been available otherwise, due to scheduling and distance constraints. The technical difficulties, however, inhibited the process.

When the equipment was initially tested with modem/network connections, few problems were encountered. During the study, however, bandwidth issues seemed to make communication difficult at times, impossible at others. To alleviate some of the bandwidth problems in this study, the participants compensated by speaking slower than normal and setting video clarity lower in favor of audio clarity. For example, one designer's journal entry laments:

Today's meeting with [the intern teacher] was completely unproductive. We had the same audio problems we did at the last meeting. That is, audio became increasingly delayed until we could not communicate at all. We tried pausing video, toggling our audio on and off when we spoke, and making sure all settings were adjusted properly.

It appears that high-speed connections are requisite for the successful use of DVC as a viable means for collaborative projects. Using network-to-network connections, few problems with the hardware technology were present. However, DVC over modems—even at higher speeds—appears to be a presenting problem that seriously impedes successful use of the full suite of collaborative opportunities potentially available to participants.

This pilot study raised several questions for future research.

1. Is it possible to alleviate some of the technical problems encountered during this pilot—if so, how?

Solutions to technical support issues are one area for further study. While initial technical assistance was provided to the participants, ongoing support may have alleviated some of the technical problems the participants encountered. However, the nature of the technical problem is an important factor—that is, if technical problems are simply characteristics of low-end DVC hardware, then they are probably insurmountable by way of a reasonable support level. The ability to readily communicate over network lines, however, suggests that the problems may be due to use of DVC over dialup connections, rather than simple hardware inadequacies. Hardware issues such as modems speed, RAM, and video drivers need to be further investigated.

2. Did low bandwidth contribute to lack of stakeholder support that was reported in this study?

Communication impediment due to electronic collaboration is another area of investigation. Bonk and King (1998) suggested a strong link between

collaborative technologies, learner-centered instruction, and motivation. According to Kies, Williges, and Rosson (1997) higher bandwidth provides greater opportunity for effective communication. Conversely, some suggest that an inverse relationship may exist between bandwidth and “effective” learning—that is, low bandwidth *forces* a focus on good pedagogy (Riedl, 1994). According to Duin, Mason and Jorn (1994) research has shown that audio-visual mediated communication is quite different than face to face. One example includes the lack of response to a speaker’s gestures. Without a forthcoming solution to bandwidth problems, how can communication through DVC be enhanced?

3. How should/can we evaluate online collaborative learning experiences?

Finally, a need for further investigation of evaluation techniques for online collaborative experiences exists. Sociocultural learning theory suggests that learners must display acquired knowledge independent of the initial presenting situation for internalization to occur (Vygotsky, 1978). How, then, does one evaluate whether or not meaningful learning or transfer has taken place in electronic collaborative environments (ECE)?

The low-cost capability to see, hear, and share documents real-time across distances through the Internet opens new possibilities for education. Even though DVC does not appear to be a transparent technology at this point in time, the participants were looking forward to future use of the technology when modem bandwidth obstacles are resolved. New connection technology such as cable modem, integrated service digital network (ISDN), and asymmetric digital subscriber line (ADSL) are likely to alleviate these types of problems. What remains to be determined then, is the evaluation method for meaningful learning or transfer in an ECE because the use of this medium is likely to grow.

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