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Melodee Landis

University of Nebraska at Omaha, mlandis@unomaha.edu

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A Comparison of Interaction in AV-based and Internet-based Distance Courses

Melodee Landis, Ph.D

Assistant Professor, Teacher Education
University of Nebraska at Omaha
Kayser Hall 522G, 6001 Dodge Street
Omaha, NE 68182-0163 USA

Tel: +1 402 554 3624

Fax: +1 402 554 3491

mlandis@unomaha.edu

ABSTRACT

At the center of the debate over the viability of distance education is whether the newer electronic technologies can offer enough interaction to maintain quality learner outcomes and critical mass. Two of the most commonly used forms of distance education are 1) two-way, fully interactive audio-video classrooms and 2) on-line instruction through the Internet or Worldwide Web. This study used qualitative methods to compare and contrast the interaction that occurred in distance learning courses offered via each medium. The research process confirmed findings that there were fundamental differences in the interaction that occurred in the two environments. On-line interaction is so profoundly different than interaction in the traditional and AV-based class room that it appears instructors and students will need a substantial period of adjustment to feel comfortable with it and to fully appreciate its value. It appears that, as distance teaching and learning moves to a "mixed media" approach to teaching and learning, how interaction is handled with each of the media may be important to the success of a distance program.

Keywords

Distance education, Distance learning, Interaction, Interactive technologies, AV, On-line learning, Internet-based instruction

Background

Recently, the controversy over distance education has been heating up. Proponents point to highly successful programs such as the Open University in Europe (Britain & Liber, 1999). Opponents question the quality of such programs (Young, 2000). Most researchers acknowledge that the field is still in its infancy and cite the need for a better understanding of how to teach effectively using the new media (Aparicio-Valverde, 1996). Because the technology keeps evolving, it may take some time to determine whether computers and telecommunications will go the way of previous technologies and become another complementary tool or whether they will become central delivery alternatives to traditional classrooms.

Historically, enrollment figures have proven that the traditional classroom setting, with a teacher and a group of students gathered in a classroom at regular and frequent meeting times appeals to more students than an independent, programmed, written course of study. Efforts to deliver daily courses via the television have also failed to attract the number of learners predicted during the early days of the media. Some theorize that the reason independent study and the television didn't meet expectations is because zealots underestimated the power of interpersonal communication in their predictions (Spencer, 1999). This has led educators to experiment with electronic technologies that offer a wider palette of tools for interaction during instruction. Some studies have indicated that interaction in on-line environments is uniquely deep and promising (Carnevale, 2000; Jonassen, 2000, Tavalin & Billig, 1999; Brown & Thompson, 1997; Whalley, 1996).

While the public debate continues, teachers in each schools or institution are trying to assess how they can best "connect" with their students in distant locations in a meaningful ways. These educators are struggling, experimenting with various technologies, hoping to discover whole new ways of teaching and interacting so that involvement can be optimized. To these individuals, the experiences of colleagues currently involved with electronically-delivered classes can be of major benefit.

Two of the most commonly used forms of distance education these days are 1) two-way, fully interactive audio-video classrooms and 2) on-line instruction through the Internet or Worldwide Web. While the two have fundamental differences, they are often the technologies of choice because they have the potential to provide interactivity during the teaching and learning process. That is, each promises a high degree of opportunity for the

students and teacher to interact as the course progresses. Since this student-to-teacher interaction is deemed by many to be important, if not essential, to a quality learning experience (Cyr, 1997; Hanson et al, 1996; Garrison, 1990), this study explored these two arenas to discover how interaction is occurring in each environment.

The Study

This research study began with the question, “Are the interactive capabilities of distance media being realized in distance classrooms?” Some researchers have been disappointed on this score, finding that the degree of interaction and satisfaction resulting from some distance courses is disappointing. Other studies find that teachers and learners report a high level of interaction and satisfaction with learning results (Hanson et al, 1996; Ahern and Repman, 1994; Bauer & Rezabek, 1992).

The mere presence of interaction, however, may not be enough. As with interaction in the traditional classroom, the quality and quantity of that interaction may be crucial to success. Other questions posed by this study included the following: What does this interaction look like in each of these media? How do instructors and students respond to the interaction that occurs? What can we learn from those experimenting with both modes that can guide us in future distance efforts?

This study was conducted in distance classes at the University of Nebraska at Omaha (UNO) delivered in the fall and spring of 1999-2000. The courses observed were of the two types described above: 1) those delivered in the State's satellite, two-way audio, two-way video distance learning classrooms, and 2) those based on the Internet's Worldwide Web. Since interaction was so different in these two types of courses, a qualitative approach was required. Classes with each of the two media were studied, coded and analyzed separately with an effort at comparison of the two sets of data.

Two-way AV courses

Five different course sessions being delivered by the University of Nebraska at Omaha were observed (four graduate and one undergraduate) as they occurred, with the researcher in the Omaha location. During four of the sessions the instructor was delivering the course from the Omaha site; during one the instructor traveled to a receive site and delivered from there. The basic data on the course dates, times, sites and attendance is included in the table “AV-based Courses Observed.”

Course session	Date observed	Time	Sites	No. of students
Course session #1	11/17/99	90 min.	Omaha Norfolk	28 1
Course session #2	11/20	93 min.	Omaha Lincoln Kearney Scottsbluff	4 4 12 1
Course session #3	12/1/99	110 min.	Omaha Kearney	17 3
Course session #4	12/4/99	90 min.	Omaha Lincoln Kearney Scottsbluff	4 4 12 1
Course session #5	12/7/99	45 min.	Omaha Grand Island	6 5

AV-based Courses Observed

Interaction observation.

During each of the sessions listed above, the researcher concentrated on how the communication among the teacher and students at various sites transpired. The codes evolved inductively as the researcher conducted the observations (Landis, 1993) and took notes. The focus of the coding process was to capture exchanges made among the instructor and students as each class progressed. The location of the speaker was recorded (delivery or receive sites) and the each communication was categorized. An effort was made to look beyond mere frequency

of communication and to capture the types of techniques used to extend or deepen interaction. Since the courses often included multiple sites, a recording form and method was developed to provide for rapid recording of who was speaking and from which location. Examples of the categories/codes used included the following:

- TT = teacher talk
- ST = local (delivery site) student talk
- S? = local student question
- RST = remote (receive site) student talk
- RS? = remote student question
- TreinS = teacher reinforces student response
- Tdir? = teacher directed question
- SNV = student nonverbal response
- TRQ = teacher responds to cue
- TXS = teacher extends student response
- SXS = student extends student response
- ScoachS = student coaches student
- RS to RS = remote student responds to remote student
- Shumor = student expresses humor

The number of times each code was recorded was tallied to determine the frequency of each type of interaction. Lines were drawn that linked each communication strand in order to visualize the complexity and length of each strand. From this visual map of communication strands, patterns could be observed and individual codes grouped into umbrella codes indicating who and what type of interaction initiated, sustained and concluded each strand.

Four of the five AV sessions observed were relatively rich in interaction. The fifth session was not as rich, possibly because it was the last of the semester and, as such, the shortened class was spent going over a quiz. Thus, the data in the table “AV-based Course Interactions” below are reported on only the first four.

Course session	Teacher instigations/ extensions	Delivery site student responses/ talk	Delivery site student instigations/ extensions	Receive sites student responses/talk	Receive sites student instigations/ extensions
Session #1	90	26	33	5	2
Session #2	27	1	2	21	10
Session #3	20	7	6	17	9
Session #4	24	2	1	7	3

AV-based Course Interactions

Because teacher talk is not overtly interactive in nature, it was not counted in the above transactions. The teacher “instigations/extensions” refer to communications in which the instructor instigated a student response with a question or direction or extended a student comment or presentation. Likewise, the student “instigations/extensions” refer to communications in which the student initiated an exchange through a question or presentation or expanded on another comment. Student responses/talk were communications in which the students acted as direct responders to classroom activities or teacher communication.

It must be noted that there were many variables at play during the above sessions. First, note that the sessions are neither equal in duration nor in the number of students nor sites. In three of the above sessions, serious technical problems were encountered. In two sessions, audio was not available at all from one of the receive sites and, in another, the sound would cut out from time to time on the instructor, who was in a receive site location. Also, in Session #1, there were a large number of delivery site students and only one receive site student. Due to the number of variables at play, comparisons between sessions were not reasonable. Yet the picture is one of a respectable amount of interaction occurring during the sessions observed.

Questionnaire and interview responses

In addition to the direct observations conducted during the class sessions, other data gathering occurred related to interaction via questionnaires and interviews. Shortened responses to interview and questionnaire questions were written on a very large paper near comments of similar substance. Circles were drawn around the grouped

comments and, where appropriate, descriptive subcategories were affixed and categories evolved. From these subcategories and categories came the concepts and themes presented here.

An early visit with one of the AV instructors revealed that his department was abandoning the AV-based method of delivery altogether in favor of Web-based distance instruction in the future. After three years of struggling with technical malfunctions and incompatibility issues, they had come to the conclusion that the toll on the instructors and students was too great. He reported that his faculty had been experimenting with on-line communication in conjunction with the AV delivery and was experimenting with the use of multiple media to present courses. This early conversation provided a unique opportunity to compare the two media and helped shape the questionnaires that accompanied the study.

Thus, in addition to the interviews and observations, students and instructors were asked about classroom interaction in questionnaires. Thirty student and two instructor responses were received. Questions 1-18 asked respondents to rate their class on the use of technology in relating to the instructor, each other and exchanging materials. Questions 19-23 asked respondents to list traits (course, student, instructor, technology, and personal attributes) that helped or hindered learning during the course. Questions 24-29 asked for student preferences on which technology for which instructional task. Question 30 asked, "In your experiences with distance education, what have you learned about teaching and learning via distance technologies?" The instructor questionnaire was very similar to that of the students; only a few items were altered to more accurately fit the instructor's role.

Characteristics of AV course interactions

While the limitations discussed above must be considered, there were some observations about these AV courses that can be noted as a result of the observations and questionnaires.

1. The techniques used by the instructors to elicit interaction resulted in more involved students. In Session #1, the instructor assigned each individual student a problem and invited each to the podium, one at a time, to present his/her work and answer. This effectively moved much of the communication for the course to the students. In the other three sessions, instructor questions, often directed to an individual, elicited most student responses. A variety of technology tools were used as well: PowerPoint presentations; overhead projection of materials, notes, images; Elmo projections; and frequent switching of camera views during instructor presentations. One instructor had become particularly adept at perceiving body language and electronic clicks that served as cues that a student was trying to talk. The energy expended by these instructors made it obvious they had worked hard to make the sessions as engaging and interesting as possible.

2. The students contributed to the liveliness of the classes as well. The last three sessions had receive site students who were obviously experienced distance learners, assertive and determined to establish a presence during the sessions. As indicated later in the student questionnaires, there may have been more of a concern that delivery site (Omaha) students were not asserting their needs as effectively as receive site students.

3. The technical difficulties experienced during three of the sessions were a definite hindrance to communication. Such incidents were reportedly the rule rather than the exception. This may explain the sometimes fragile quality of interactions of the sessions. For example, one class was without audio altogether in two sessions and the instructor's audio cut out during another. In addition to the more obvious technical problems, the audio system design reportedly affected students' responses because it required them to press a button on the mike to talk. Also, when one person is talking, including the instructor, the system automatically blocks other would-be contributors, making it awkward when simultaneous comments occur.

4. Student's questionnaire responses from the delivery site tended to be more negative than those from the receive sites. Reactions to how the technology affected interaction are typical of the delivery site vs. receive site dynamic. Negative comments about the technology outweighed positive comments 10 to five at the delivery site and some indicated that it was the technology that inhibited their interaction (A few expressed a fear of using the microphone.) As one student put it, "I personally found myself not participating in class discussion near so much as I normally would." Negative reactions from Omaha students were even more marked when the instructor traveled to one of the other sites to present.

5. Some expressed gratitude for the opportunity to interact with diverse peers in other parts of the State. While only nine of the questionnaires were returned by receive site students, at least one of the courses included a "cohort" group in the Kearney region. These students have taken their course sequence together and their

comments reflected their deeper experience with distance learning and their camaraderie: “The Kearney cohort had great communication, other sites didn’t”.

Internet-based courses

The interactions observed in the Internet-based courses were of a dramatically different nature than those exhibited in the AV-based courses. The researcher gained access to six different courses, one undergraduate and five graduate, and conducted an in-depth study of one site because of its rich interaction record. Several factors made it a challenge to study on-line interaction. First, the interactions occurred on a variety of tools. Second, this was a relatively new mode of teaching and learning at UNO. Third, the interactions are qualitatively different than those experienced in face-to-face or AV-based teaching and learning.

The tools available for interaction during on-line instruction are in an early stage of development. The courses observed illustrated this state of flux, choosing various combinations from among the possibilities listed in the table “On-line Course Tools”.

Form/tool	Organization	Characteristics
E-mail	Asynchronous, separate e-mail addresses per individual	Directed to individual or small group; often single purpose and receiver per each post
Listserv	Asynchronous, one e-mail address for group sharing an interest/activity	Provides mass distribution to large group of individuals through each's e-mail site
Chat	Synchronous, participants come to central site at designated time. Often a common purpose/interest is shared.	Allows for spontaneous interaction (often anonymous) by individuals who opt onto same site. Several disjointed conversations can be pursued at one time due to lag time while people type. Usually disappear at conclusion.
Discussion Group/ Message Board	Communications are organized by topics on a central "board" and usually "threads" are formed when responses to the topic are indented under each.	This ongoing record of interaction documents participants' communication history. The titling, the outlined organization, and the permanence of the record can help to organize concepts, distribute responsibility.

On-line Course Tools

While the on-line interactions studied were approached with similar qualitative strategies (observation, categorization, etc.), it was immediately obvious that the counting and real-time recording/categorizing were not appropriate. Thus, the written conversations were captured in print form and the categories and schema arose from observations and analyses more tailored to the sample at hand. In the courses studied, a variety of approaches were being tried to promote on-line interaction. The major communication tools available to an Internet-based course include e-mail, listservs, chats and discussion/message boards as depicted in the table, “Specific On-line Tools Used”, below.

Course number	Form of interaction	Tools
Course #1	Online chat	CourtTV online chat
Courses #2, 3, 4	Message Board	Message board software
Course #5	Community club site/discussion board	Service of excite.com
Course #6	Discussion board & chat	Blackboard’s CourseInfo

Specific On-line Tools Used

Course #1's on-line chat was a supplemental activity for a regular class. Courses 2-4 are so grouped because they were from the same department and used the same software. Each of these modes "feels" a great deal different than face-to-face interaction. In Courses 2-5, e-mail appeared to be the preferred mode of communication. This may in some cases have been because of the effort it takes to access a separate Web site or the confusion created by the variety of advertisements, frames and format of some tools. There are advantages and disadvantages to each of the tools. Chat sessions captured some of the spontaneity and interest common in face-to-face interactions. Discussion/message boards offered an ongoing opportunity for deeper discussion.

It was on the discussion/message board that the deepest conversations were found. In particular, the in-depth discussions were most evident one graduate course, Course #6. It is from Course #6, therefore, that much of the deeper analysis here is drawn. The course site required a user ID and a password so was confined to course participants. Interaction on the board was a required part of the student's course grade.

Characteristics of on-line interaction

The attributes of on-line communication are arguably unique to the medium. For UNO, it was obvious that the environment was territory largely unknown to participants. The list of characteristics below only begins to describe this new form of communication. No doubt even more profound observations will be made in upcoming months and years that will help to guide us in this new arena. Again, a qualitative approach was taken during the observations described above to derive the schema below, with an emphasis on the more in-depth interactions that occurred during Course #6 on the discussion board. The interactions observed in on-line discussion boards displayed the following characteristics:

1. *A combination of linear and non-linear interaction.* Face-to-face classroom interactions occur in a stream that is time-based and basically linear; that is, one expression leads to another. There are leaps, interruptions and disconnects but the flow of the stream is basically controlled by the instructor with occasional delegation to students. In on-line communication, "threads" are established on specific topics. Time flow is not observable via this medium; these threads are delineated by the subject or title of the communications and through indentation as illustrated below in the "Sample Discussion Topics" table.

- Minimum Wage	Instructor	16-Feb-2000	New
- Re: Minimum Wage	Student 1	17-Feb-2000	New
- Re: Minimum Wage	Student 2	17-Feb-2000	New
- Re: Minimum Wage	Instructor	18-Feb-2000	New
- Re: Minimum Wage	Student 2	18-Feb-2000	New
- Re: Minimum Wage	Student 2	17-Feb-2000	New
- Re: Minimum Wage	Student 1	19-Feb-2000	New
- Re: Minimum Wage	Student 2	19-Feb-2000	New
- Re: Minimum Wage	Student 1	20-Feb-2000	New
- Re: Minimum Wage	Student 3	21-Feb-2000	New
- Re: Minimum Wage	Student 1	21-Feb-2000	New
- Rent control	Instructor	16-Feb-2000	New
- Re: Rent Control	Student 1	17-Feb-2000	New
- Re: Rent Control	Student 4	18-Feb-2000	New

Sample Discussion Topics

The participant uses several cues to follow the threads:

- title/subject/topic
- indentation
- "Re" appearing in the subject field when responding to a given topic
- date
- highlighting (the message changes color after it is opened and the message that has just been opened is highlighted on the list)

In this particular software, the word "New" in the last column indicates that the message has not been read; it disappears when the each has been opened. Notice that the dates are non-consecutive in some cases, indicating perhaps an error in posting somewhere along the network line. Also, gaps in the dates show the propensity of some students to come back and add comments over time.

2. *Reliance on written conversation.* When participants are writing responses instead of speaking, they are relying on totally different modes of communication. This, no doubt, appeals to some students' strengths and others' weaknesses. Expression can be both facilitated (in that there is time to think, comprehend, compose and revise one's thoughts) or impaired (if the student's reading/writing skills are weaker than their speaking skills). In this age of image-based media, it is remarkable that this medium requires the use of communication modes (reading and writing) that many believe are waning.

3. *Density*. When a course relies mainly on the discussion board for communication, the most salient characteristic of the record is its density. Interactions consist of a large number of interactions, many topics, and often many participants.

4. *Depth*. The interaction on some topics on Course # 6's discussion board appeared to be pursued to a much deeper extent than those that typically occur in the face-to-face or AV classrooms. It was not unusual for a given topic to consist of 20-30 interactions. Some popular topics stretched to around 50 interactions. By contrast, the AV-based course sessions' deepest discussions topped out at around 9 interactions.

Additionally, Benjamin Bloom would have been pleased at the level of thinking exhibited by many of the comments, especially as participants gained experience. Much of the interaction on some of the topics occurred at the application, analysis, and evaluation levels of thinking as the example below illustrates. The names have been changed for confidentiality; the minor errors retained. The discussion is on whether social security ("SS" in the posting) should be voluntary.

(Jeanette),

I agree with you that (the text author) probably wouldn't support making SS completely voluntary. He outlines the many market failures that gave rise to the need for government intervention. These failures include your example of people being unable to unwilling to save (in part I think this amounts to unequal information or an unlevel playing field). They also include the inability of the market to adequately protect against widespread impact events such as a nationwide recession.

I am not sure if (the text author) would support this but I like the idea of making the system partially voluntary. I like how (he) divided SS into two parts. The first part, which I think should be mandatory, that provides a minimum level of support for everyone after retirement. The second part, that provides a base upon which to build a heftier retirement, I would like to see be either optional or more diversified. That is, people would be allowed to opt out of the optional portion (if we're worried about people not investing, maybe they could opt out only upon proof that they are investing elsewhere) or would be offered options as to how that optional portion was invested. Then the payout of the optional portion upon retirement would be more closely tied to contributions.

Granted, there are problems with implementation of this idea. First, there has to be some provision made for those who retire while the program is in transition, or before any choices instituted in the program have the opportunity to take place. Second, the administration of the program becomes more complex the more choices there are. Finally, if an option to completely opt out is available the benefits available in the govt. program would have to compete with the private sector investment options.

I guess this is sort of a balancing between theories (a pluralistic approach). The first, part, the minimal-level for all is somewhat utilitarianist in that it requires good for all. This portion could also possibly be categorized as Rawlsian primary goods in that a certain amount of income is needed by everyone. The later part is a distribution theory of to each according to his or her contribution.

Any constructivist would approve of the thinking displayed here. The author's comments move among Bloom's higher levels of thought. She applies the text author's thinking to the question at hand (application), interprets it in her own words (comprehension), gives her personal reaction to each of the author's elements (evaluation) and, in effect, creates her own proposal for how social security should be handled (synthesis). In conclusion, she pulls back in the last paragraph and relates the ideas in the previous paragraph to larger philosophical approaches and theories (analysis, evaluation).

The ideas proposed in the above message served as the basis for most of the subsequent comments, including the instructor's. The "thread" consisted of 36 postings - a thorough discussion indeed.

5. *New roles*. In Course #6, it was observed that at first the instructor initiated the threads/topics. As communications flowed on, it became more common for students to initiate and for the instructor to chime in from time to time. Students seemed to intuitively rotate the role of leader with some stepping forward fairly often and others rarely if ever taking the lead.

In addition to revolving leadership roles, the nature of participation, where time and attendance are at the discretion of the participant, call for self discipline that is different from the traditional classroom. Instead of having to discipline themselves to physically and mentally attend a session led by an instructor where the student may remain passive through most of the lesson, students are required to participate and help to lead the lessons themselves with guidance from an instructor.

6. *Evolution of a communication style.* A group style seemed to evolve over the span of interactions. Titles moved from assignment-based ("Chapter 2", "Question 13", etc.) to topic-based ("Social Security", "Socialism", etc.). Many participants became briefer in their communications. Personal names were used to refer another's comment or posting. Individual styles were evident within the group style: some wrote in brief snatches, others in long paragraphs; some used exclamation points, capital letters, introductory organizers, etc.

7. *Ability to move from one style of communication to another.* In a Web-based course, the instructor has several different modes at his/her disposal (posting on the Web site, e-mail, chat, and discussion board). This provided an opportunity to move from one to the other and even do individual coaching via e-mail as the course proceeded. While students did not usually have the ability to post much other than their personal web site, they, too, could move between e-mail and the more public discussion board, allowing them the luxury of individual counseling from the instructor, private asides with a co-student and even social interaction with others.

8. *Change in the function of time.* Because of the nonlinear, asynchronous nature of communication on a discussion board, time is used differently during the course. More solitary thinking, checking of sources, and independent analysis may occur since the individual has more time to respond. Also, since the time selected may be continuous and regular or sporadic and short-lived, the learner, rather than the instructor, controls when and under what conditions interaction is engaged.

9. *Compensation for interpersonal affect.* Since the participant is unable to see and hear other participants, the usual facial, inflectional and body language signals are missing. It is interesting to see ways people try using text to express or recreate face-to-face exchanges. Sideways happy faces, exclamation marks, dots, spaces, names and expletives make their way into on-line communication.

10. *An environment of dichotomies.* Just as in face-to-face environments, this new mode of communication has its ups and downs, insecurities, personalities, disagreements and triumphs. It is at once more isolating, because most of the activities are performed alone, and more communal, since it can be argued that more interaction actually occurs than in a regular classroom. It is more structured in how content is ordered and communicated, yet more flexible since teacher-centered control is diffused. It is more restrictive, confined to two-dimensional images, reading and writing, yet more free-flowing, allowing for unfettered input/leadership.

Thus, we see in the on-line environment the beginning of a new mode of communication for teaching and learning. One in which time and linear interaction are no longer the organizing elements. The biggest challenge appears to be helping teachers and learners to 1) become accustomed to such a different learning mode, 2) manage the large amount of information and 3) adjust to the increase in effort and time that on-line teaching and learning may require. But it appears that this new arena may offer unique opportunities for more student-directed, in-depth interaction on course material.

Comparison of AV-based and Internet-based Interaction

So, what does this study suggest about the differences and similarities between AV-based and on-line interaction? Again, it is important to note that UNO is in a very early stage of distance education as an institution, particularly on-line education. Nonetheless, these early responses may be valuable in helping to shorten the learning curve and to form hypotheses for future experimentation with the two media.

Difficulties

The questionnaire responses portray a group of students who were, for the most part, new at using the technologies, especially the computer. Many comments were made by and about students who had difficulties with computers, software or on-line functioning. This, no doubt, influenced the interaction that occurred, as suggested by one student, "A few of the students seemed to not understand how to properly use the discussion board...This made the discussions difficult at times."

These troubles so plagued the AV-based courses that, after three years of struggle with the statewide satellite system, one department has abandoned the two-way AV network altogether in favor of the on-line mode of instruction. Students also articulated their frustration. Several blamed the technology for the inability to communicate with other sites, hear the instructor or pay attention during the classes. Students in both computer- and AV-based classes expressed irritation with access. Computer users reported trouble getting connected and one was agitated that s/he had to buy a new computer to access the course Web site. AV students pointed to the microphone as the major barrier. Some commented that they missed the interpersonal connections of a traditional class and were emphatic about preferring face-to-face interaction. Others reported that they interacted almost exclusively with those at their site.

Potential

There were some hardy souls, however, who saw the promise of this new way of interacting. "It was great!" effused one receive site student when commenting about interaction. Another receive site student commented, "This is a great tool to get to visit with students throughout the state...to share ideas with a diverse group of students." The Omaha students were more guarded in their enthusiasm...

I felt I received the use of e-mail and AV worked very well. Since I was in Omaha, I felt the face-to-face interaction was great. I don't know if I would feel this way if I was in Kearney or Scottsbluff.

An interesting contrast occurred when students were asked to check which mode/media they preferred for each instructional task. For questioning the instructor and carrying on instructor-student discussion, they preferred e-mail (21 and 28 tallies respectively with 32 responding), followed by two-way AV (11 and 10 respectively out of 32). The discussion/message board also garnered a respectable 11 tallies for questioning the instructor and 6 for instructor-student discussion, especially considering that it wasn't available in most courses.

For student-student discussion, respondents preferred e-mail (23 tallies of 32 respondents). Discussion board came in second at 11. Respondents also rated their class's ability to deal with the various technologies relatively high. When asked how well they dealt with each technology, they felt most secure relating to the instructor and each other face-to-face but also gave themselves high rankings in the use of AV and e-mail (see table, "Students' Ratings of Effectiveness of Various Media" below).

How well do you think your class dealt with the following elements of distance learning? (1=poorly to 5=very well)

relating to the instructor using audio-video technologies	3.79
relating to the instructor using e-mail?	4.23
relating to the instructor using discussion/message board?	3.7
relating to the instructor using the telephone?	3.07
relating to the instructor face-to-face?	4.24
relating to other students using audio-video technologies?	3.58
relating to other students using e-mail?	3.88
relating to other students using discussion/message board?	3.32
relating to other students using the telephone?	1.8
relating to other students face to face?	4.32

Students' Ratings of Effectiveness of Various Media

It would be interesting to follow this in the upcoming semesters as UNO faculty and students accustom themselves to discussion boards and chat functions.

Teacher as critical factor

Just as would happen in the traditional classroom, the students' ratings and comments on their instructors depended on which instructor they had. In those courses where the interaction frequency was high and where the instructors exhibited a variety of involvement techniques, the students often credited their teachers with a high

level of skill. Individual students noted that the instructor was responsive to students electronically, was a "great facilitator", or did "a good job of trying to involve all students by asking questions and encouraging participation."

In at least one case, however, students were brutally honest about their instructor's perceived inept handling of the technology, citing his "lack of understanding of how to effectively utilize the technology" or discern which media to use for which activity:

Professors should be organized enough to have notes or outlines on the web site...E-mail is great for keeping everyone informed about assignments and information but should not be used for course content. The text material on a web site should be logical and either dated or numbered by class date or assignment. Discussion board should be used for discussion not just for the posting of information. Discussion means more than just putting up your own ideas. It means discussing what others have posted also.

Media comparisons

Some of the most revealing analysis related to interaction in the distance learning classroom came from instructors. An in-depth interview was conducted with the two instructors who had extensive experience in AV-based distance education and had been working with on-line distance education during the past year.

Both instructors preferred on-line interaction to interaction over the two-way video and audio system. Instructor 1 stated that AV interaction was "more stilted" and students' responses to it largely depended on the degree of technical reliability. Instructor 2 stated that the "tech is more of a barrier with the AV." In those sites or courses where the technology was dependable, the instructors agreed that students responded well; the students who were at sites where problems were prevalent were very negative.

The two instructors were most intensely interested in talking about their experiences with distance interaction. Instructor 1:

Students are more isolated in an AV classroom. There, you hit an issue or have interaction then immediately do follow-up questioning. There's no reflective time for the students. On-line there's time to give a more cogent response. The threads are deeper on-line.

In illustrating the difference between AV and on-line interactions, The conversation below between Instructor 1 and Instructor 2 articulated a common pattern of interaction and contrasting manifestations in the two environments:

Instructor 2: The typical pattern for AV is: You (the instructor) pose a question. First, Student A gives a textbook response. You say, "Yeah" but ask for a practical application of the material and then let them go at it for awhile. Then you decide when to jump in or when not to.

In the AV classroom, sometimes you get no response or, at best, a few people respond. You try to extend it farther but it rarely goes on from there.

On-line, the student has to respond. For example, in a discussion on minimum wage and rent control, one student jumped in with his thoughts on rent control and he hadn't read the material. So, I ask him how he reconciled his opinions with the position of the text. Then he had time to go check the text. So, it makes them read it in a way that they apply it and when they see this happen, other students don't want to just say something off the top of their heads. So you get better responses.

Instructor 1: I try to structure questions hard enough for them so they won't just go shooting off. The instructor has more time (on-line), too, to reword questions.

Instructor 2: When the students get used to the process, they'll start a thread. Some go nowhere. Some go on a long time. Our students are now pretty well-versed for on-line work.

Instructor 1: Yeah, it's much more stilted in AV. Ideas get thrown out but they don't always follow up on the thread...And in one class, the students do a project that requires them to think about the process

and then later do their own problem-solving. They get it conceptually but then have trouble doing it. On-line discussion may help this because they'll have to understand the concept earlier and I'm hoping then they'll be able to do it better.

This depiction of how interaction occurred from the instructor's point of view was informative indeed. One instructor compared on-line communication and instruction to one-on-one tutoring. They granted, however, that the students may not have valued the depth of interaction as much as the instructors did. They reported that the students in a past course (where the two instructors team-taught) felt they worked harder but didn't learn as much. The instructors, however, both felt that the students worked harder but felt they learned more. Why did they feel the learning is greater? Instructor 2:

You can't fake it in an on-line class. They can show up in a regular class and do nothing. But, on-line, I can count objectively and they know I do.

Conclusion

The purpose of this study was to capture a snapshot of interaction in the two most commonly used media in distance education. Both purport to be fully interactive and are selected largely due to this claim. In this small study, the Internet mode of interaction appeared to be the preferred choice by both students and instructors, when compared to the AV-based delivery. For the students, the technical difficulties experienced in the AV-based classrooms seemed to be the primary factor. For the instructors, however, the richer, deeper analysis on the part of the students sold them on on-line interaction.

1. In the few courses studied, students responded more positively to the Internet-based courses than the AV-based courses. The major reason cited for this difference was the degree of technical problems suffered with the AV system.
2. Interactions in the AV-based classrooms more closely resembled those in a traditional classroom. Instructors reported that most interactions in the AV-based courses were initiated by the instructor, followed by student response, followed by instructor prompting, etc.
3. On-line interactions varied drastically from those in the traditional classroom. These interactions portrayed new instructor-student roles, differing styles among writers, denser and deeper communication sequences.
4. Concepts, rather than time, are the organizational elements of on-line communication. This is a fundamental difference compared to the traditional classroom and it seems likely that a great deal of experience and training will be need for some instructors to make the transition.
5. Even though instructors reported deeper, better interaction in the on-line courses, the students evaluated the on-line courses more harshly than traditionally-delivered classes. More study needs to be done here. Is the difficulty in how students define quality learning experiences? Do we need to be "selling" these courses to students as the courses are delivered to them? Does student experience make a difference here?
6. For both delivery media, students point to the instructor as the major factor in whether distance courses are quality.
7. Some students and most instructors express confidence in the promise of the new learning media, especially when committed instructors and students work together.

Thus, it appears that instructors who are not adept at managing complex written communication may prefer the AV-based learning environment. Investigation into the degree of technical problems occurring in a given AV system may also be central to whether this form of delivery should be attempted. Innovative instructors attracted to issue-based, student-centered learning should be encouraged to try the Internet environment to continue to test the possibilities of this totally new form of communication.

Researchers are also encouraged to continue investigation into the qualitative differences between the two learning environments. As distance teaching and learning moves to a "mixed media" approach to teaching and learning, how interaction is handled in each media may be central to breakthrough techniques (Karaliotas, 1997). More research is our best hope for guiding the use of these tools so that the result is improved learning. For

now, however, too many participants continue to express malaise with the process. Thus, it is clear that we have some work to do before teachers and students alike are content that these new "interactive" media will live up to their reputations.

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