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# Modifying the Teaching/Learning Process in an Interactive Video Network: A Systemic Analysis Approach

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## **Abstract**

Technology mediated learning requires adjustments in the teaching/learning process for both instructors and students. This article draws on the concepts of system theory to explain how interdependence, permeable systems, boundaries, and parallelism can alter the teacher's role in fostering a climate that maximizes technology-mediated learning. Creating an inviting classroom atmosphere, modifying instructional design and content, listening to feedback, and evaluating the course provide the foundation for revising the teaching/learning process for use with interactive video network (IVN). An environment of trust and openness leads to dialogue, reflection, and transformative learning for students and instructors. Formative and summative evaluations define details within instructional design and content needing modification for use with technology-mediated learning. This article presents suggestions for creating a community of learners through the interactivity of educational experiences while upholding quality educational standards.

## **Introduction**

Ninety one percent of public two- and four-year institutions offered, or planned to offer, distance education courses by the year 2000-2001 (National Center for Education Statistics, 2000). The advantages of distance education include increasing student access to higher education and reducing travel and scheduling problems (National Center for Education Statistics, 2000). Technology-mediated learning within distance education takes many forms. The National Center for Education Statistics (1999) reports that in 1995 the most frequently used method of delivering distance education courses were two-way interactive video (57%) and one-way prerecorded video (52%). Of the institutions of higher learning that were currently using or planning to use distance education, 80% indicated that they would start or increase the use of two-way interactive video within the next three years (National Center for Education Statistics, 1999). Thus, interactive video network (IVN) is a popular choice of institutions wishing to offer distance education.

Clearly, most public two- and four-year institutions are using distance education. Utilizing technology to improve education, as advocated by the National Education Association (1995), and maintaining quality educational standards (NEA, 1999, 1998) requires teachers who model mastery of the teaching/learning process as well as skill in modifying that process for use with technology (Barker & Baker, 1994). However, as Phipps and Merisotis (1999) suggest after an extensive review of research on the effectiveness of distance learning in higher education, we have a lot to learn regarding the ways and means that technology enhances the teaching/learning

process.

Technology provides excellent long distance communication possibilities yet physical distance and social and psychological separations (Ashe & Buell, 1998) often hamper genuine dialogue and, in turn, impede learning. Thus, the problem of creating a true community of learners exists throughout distance education and requires a relationship to be established among and between teachers and learners (Clark, Sanders, & Stammen, 1999; NEA, 1998). In short, the role of outreach specialist has been added to the position description of university professors (Day & Baugher, 1999); achieving proficiency in this new role requires modifying the traditional teaching/learning process.

A recent National Education Association Poll (NEA, 2000) of instructors of distance learning courses, however, suggests that instructors believe quality learning can occur through distance education. The question, then, becomes: How can distance learning instructors create a true community of learners while providing quality learning experiences? The purpose of this article is to discuss modifications to the traditional teaching/learning process that enable distance learning instructors to create a community of learners while upholding quality educational standards. Because many interactive elements are involved in this process, a systemic approach (von Bertalanffy, 1968), in which the whole system is considered, is necessary. The core concepts of general system theory 1) organization, 2) control, 3) energy, and 4) time and space (von Bertalanffy), help clarify change when using technology in education.

Systemically, the teacher is at the top of the hierarchy (Whitchurch & Constantine, 1993) in the classroom; the organization of the classroom system is dependent on the teacher. Thus, the teacher's role is considered essential in fostering a climate that maximizes technology-mediated learning (McHenry & Bozik, 1997). The teacher creates an inviting technology-mediated classroom atmosphere (Gallaher & McCormick, 1999) in which rules define behavioral roles and, therefore, the boundaries of the system (Becvar & Becvar, 1996; Whitchurch & Constantine).

Secondly, the teacher's control regulates the amount of change in the system. Systemically, information from students forms a recursive loop that feeds back into the system and affects future actions (von Bertalanffy, 1968). By listening to student feedback (Ashe & Buell, 1998), teachers modify the instructional design and content (Gallaher & McCormick) so that students have a stable but dynamic, growing experience (Becvar & Becvar, 1996).

Thirdly, the teacher monitors the energy in a well-functioning classroom. The concept of thermodynamics states that, over time, energy loss occurs (von Bertalanffy, 1968). If too much or not enough information comes to the students, the classroom atmosphere becomes disorganized or disintegrates (Becvar & Becvar, 1996). Therefore, in a well-functioning classroom, the teacher screens out information that will not be helpful and avoids change that threatens the classroom atmosphere (Becvar & Becvar, 1996).

Finally, the systemic concept of time and space refers to structure, the organization of the specific classes (parts) in relationship to the whole course, and process, the ongoing functions of the class over time (Nichols & Everett, 1986). The systemic concept of time and space suggests the necessity of both formative (ongoing) and summative (final) evaluation of distance courses (Ashe & Buell, 1998) as recommended by the NEA (1998).

In summary, systems theory considers the entire system (von Bertalanffy, 1968). Reciprocity, recursiveness, and shared responsibility are emphasized (Becvar & Becvar, 1998). Rather than

looking at isolated incidents or people, the process or context that gives meaning to behavior is the focus for change (Becvar & Becvar, 1998).

Experiences in a capstone course in which students in multiple majors within one academic unit are separated by 90 miles but linked by interactive video provide an illustration of the systemic concepts in action as instructors create a community of learners while ensuring quality educational experiences. Four areas will be addressed: classroom atmosphere, instructional design and content, feedback, and evaluation. While the focus of comments in this article is on one aspect of distance education, interactive video network (IVN), many techniques are transferable to other technology-mediated learning situations.

### **Classroom Atmosphere**

In creating an environment for learning, the systemic ideas of interdependence and isomorphism influence the affective environment and are crucial in creating an open, permeable and optimal learning system. Therefore, creating a learning environment for distance education involves the setting, conditions, and people who interact to produce a learning environment characterized by the presence of focused dialogue.

Immediate involvement in a simple and ultimately successful small group task (Gallaher & McCormick, 1999; Roblyer & Ekham, 2000) begins the dialogue between students and teacher (Vella, 1989, 1994), establishing focus and setting the stage for learning (Rezabek, Cochenour, Bruce, & Shade, 1995). While the getting acquainted process takes time, having students work together to find connections between themselves, both personally and collectively, and course content facilitates interaction and a sense of community (Gallaher & McCormick, 1999).

The capstone course, designed for in-depth study of quality of life, the contemporary issues affecting it, and the impact of professionals in it, requires small groups of site-based and cross site-based students to get to know each other. Students come to consensus on: 1) skills the group possesses, 2) roles of group members in the class, 3) the role of the teacher in the class, and 4) concerns of group members regarding the well-being of children and families in the state. After students introduce themselves and discuss their skills, roles and understanding of families, other concerns are shared.

Responses to student and teacher roles (see Table 1) create clear boundaries; they relate to the classroom's affective environment and address personal growth issues. Discussion of student skills and concerns relate to course content and contribute to student's realization that they have the foundational skills necessary to build the class as outlined in the syllabus. Both students and teacher refer to the lists throughout the semester. This simple activity provides social safety, allowing learners to get to know a small group of class members as well as receive affirmation for their ideas and clarification of everyone's role (Vella, 1994). Just as importantly, students from the two sites begin the process of functioning as one group. Systemically, discussion and consensus on both internal and external issues are an isomorphic (von Bertalanffy, 1968) exercise; class experiences parallel skills needed for work in the larger community, a major goal for the capstone class.

**Table1. Roles of Students and Instructor**

<b>Students</b>	<b>Instructor</b>
<ul style="list-style-type: none"> <li>● Be prepared, know material, be studious</li> <li>● Do the work and keep up with the work</li> <li>● Be on time</li> </ul>	<ul style="list-style-type: none"> <li>● Teach so students understand</li> <li>● Share current issues</li> <li>● Explain clearly</li> </ul>

- Listen, pay attention, be alert
- Participate, communicate, ask questions
- Seek more information

- Answer questions
- Give insight
- Be prepared
- Be helpful, supportive
- Challenge/stretch students' minds
- Be fair/courteous
- Pay attention

Continuing to create the environment for learning and building on the concept of interdependence begun in the introductory learning experience, the opening lecture articulates the systemic idea of each person in the class contributing to the strength or downfall of the class's success or failure. Verbally expressing interest in learning and doing well when defining their roles as students and identifying the teacher's role in the teaching/learning process conveys the systemic notion that as individuals and subsystems within a larger system, students and professor influence and are mutually dependent on each other; students at both sites contribute to the class's success. Likewise, in the world of work, success depends on the mutual contributions of all employees to the organization's goals and objectives. Students must want to learn just as employees must want to grow. Growth behavior must be modeled up and down the academic and workplace structures. This concept of isomorphic parallelism is a foundational systemic concept (von Bertalanffy, 1968).

Working from ideas formed in small group discussion and presented in lecture, students form site-based and cross site-based groups to draft ground rules for the class, expressing their own and others' responsibilities (see Table 2). Small group dialogue resulting in planning and taking responsibility for the learning process allows all voices to be heard, all participants to be respected, and a safe learning environment to be created (Vella, 1989, 1995). In addition, establishing and upholding group norms reduces win-lose situations and creates space for reflection and discourse (Mezirow, 1996); both are crucial to the affective environment.

**Table 2. Ground Rules**

1. I will come to class on time.	You will come to class on time.
2. I will be prepared for class.	You will be prepared for class.
3. I will respect you.	You will respect me.
4. I will share and participate with you.	You will share & participate with us
5. I will give you many chances to speak.	You will give others chances to speak.
6. I will listen to you; I won't interrupt or talk when someone else is talking.	You will listen to me or whoever is speaking; you won't interrupt the speaker or talk between yourselves.
7. I will pay attention to what you say and present to the class.	You will pay attention to what I and others say and present in class.
8. I will accept what you say, even if I disagree with it.	You will accept what I and others say, even if you disagree with it.

A warm affective environment lowers anxiety and contributes to the creation of a true community of learners who recognize their boundaries yet are open to new ideas and change. A classroom environment in which interaction and interdependence are encouraged promotes learning in the technology-mediated classroom.

## Modifying Instructional Design and Content

As recommended by the National Education Association (1999, 1998, 1995) and evaluations of distance learning (Inman & Kerwin, 1999; Loeding & Wynn, 1999; McKenzie, Mims, Bennett, & Waugh, 2000; Rockwell, Furgason, Marx, 2000; Rockwell, Schauer, Fritz & Marx, 2000; Williams, 2000), teachers need training in distance education as well as adequate time for preparation and instruction. With training and time for thoughtful modification of traditional teaching methodology, instructors can enhance the teaching/learning process for use in IVN settings. The three program perspectives of transmission, transaction, and transformation (Thomas, Schaneveldt & Young, 1993) frame possibilities for change.

**Transmission.** The transmission perspective involves preparing students through lecturing or transmitting the facts, skills and values necessary to "fit into society" (Thomas et al., 1993, p. 113). Instructors, practiced in lecturing, find their normal lecturing style requires modification for use on IVN. Television, normally a non-interactive medium, portrays the lecturer smaller on the television screen than in person. Instructors' restricted movement and inability to see the faces of off-site participants well enough to "read" their facial expressions, as well as students' hesitance or unwillingness to respond because of touching the microphone before speaking often slows the lecture process by about 10% (Lyn Harper, personal communication, February 1997).

Remote site students, required to watch the television screen for 3 hours, often have difficulty listening and volunteering responses. Therefore, keeping students' attention is a challenge. During initial introductions, focusing the camera on participants' faces so that they may get used to seeing themselves on television and get to know each other works well (Rezabek et al., 1995). Preparing a seating chart of remote site participants and name cards for transmission site students allows instructors to request responses by calling students' names. Focusing the camera on students' faces when they speak and looking directly into the camera lens when instructors' speak also helps keep participants' attention. Other techniques include changing the pace of class with short, 10-15 minute lectures, teaching outlines or structured notes, group work, open-ended questions, and one minute papers requiring students to write their immediate response to a lecture in just one minute (Cyrs & Smith, 1990). Another exercise to keep students focused is "Write, Pair, Share" (Walker et al., 1999). About 15 minutes into a lecture ask students to write three ideas they have learned thus far and one question they still have. Let them exchange responses with a neighbor, being sure to have a pair of cross-site participants for telephone interaction, and request feedback. Finally, move into a discussion of students' questions and then finish covering points in the lecture that have not been addressed through questions and dialogue.

Visuals, prepared on pastel paper, using a minimum of 24 point upper and lower case, sans-serif font, in landscape position, and used on the ELMO camera also aide lectures (Rezabek et al., 1995). Handouts, prepared and sent to the remote site several days before class, encourage advance organization and preparation. Having backup activities alleviates instructors' anxieties about the technology malfunctioning (Rezabek et al.). Presentations using video tapes, CD music, power point, and even card tricks on the ELMO camera are viewable at the two sites simultaneously. Finally, having one instructor or staff person physically present in the remote site classroom on several occasions allows students to talk directly with a facilitator, encouraging interactivity.

The transmission perspective is easily adaptable to the IVN format. Instructors provide foundations for learning through direct transmission of information and students' interactivity keeps them focused and participating in the learning process.

**Transaction.** The second perspective, transaction, which assumes learners are active, rational thinkers who participate in problem-solving (Thomas et al., 1993), is often built into traditional courses but IVN requires modifications. To involve all participants in problem solving activities, students from the remote site may volunteer to form a work group with someone from the transmission site. Using the podium microphone and standing in front of the camera, students problem-solve while getting to know each other; the two sites function as one. Other work groups address issues off camera before all groups share conclusions with the entire class. Another transaction technique useful in keeping participants focused and thinking involves listening teams who have three minutes to determine two questions from the class session to ask during class closure.

Technology addresses the issue of problem-solving in the IVN classroom in other ways, also. Telephone conversations between dyads, e-mail communication, and FAXing written material between the two sites increases interactions. In the capstone class, students use the computer's direct hook up to the internet to research legislation as they decide on a bill for study.

Modifying instructional design to include cross-site participation allows students to open the space between them in order to get to know each other better and solve problems. Such permeable boundaries allow information to come into the system, to be discussed and then disseminated among all class members.

**Transformation.** While transmission and transaction are necessary in the teaching/learning process, course goals to facilitate students' personal and social change require use of the third perspective, transformation (Mezirow, 1990, 1994, 1995, 1996; Thomas et al., 1993). In the transformation perspective, knowledge, coming from social interaction and fostering personal and social change, requires reflection (Mezirow, 1981, 1990, 1994, 1995, 1996; Vella, 1994, 1995). Transformation requires that students examine assumptions on which they base decisions, objectively consider facts, reflect on discrepancies, alter perceptions, and make new decisions (Mezirow, 1981, 1994, 1995, 1996; Morgaine, 1992). As Mezirow (1996) stated "A transformative learning experience requires that the learner makes an informed and reflective decision to act" (p. 163-164).

In the capstone class, several experiences facilitate transformative learning. Guest professionals, speaking from both sites, bring different perspectives and teaching techniques to the class. Speakers' stories of everyday realities challenge students' views of family life and help them gain insight into the diverse complexities characterizing today's families. Presenting students with new information, which may be disorienting, requires thoughtful reflection on their part in order to "make sense" of the new information in respect to long held belief systems. An environment of trust, mutual respect (Cranton, 1994; Mezirow, 1996), tolerance, and openness are necessary to facilitate thoughtful reflection (Mezirow, 1996).

Class members form site- and cross-site based groups to study pending legislation affecting the quality of life for families. Students study the intended and unintended consequences of legislation on persons of different ages, cultural, ethnic, and economic backgrounds. Reading pertinent journal articles and critiquing them allows students to more thoroughly understand and reflect on the issues involved in the legislation. After personal and group research on the chosen legislative issue, students present their bill to the class, making their case for or against the bill. Lively discussion follows, requiring presenters to clarify and defend their decisions. The culminating activity requires students to write one of their legislators giving justification for or against support of their chosen bill, clearly showing the impact of the bill on families' quality of life.

Listening teams, reflect on presentations by guest speakers and student legislative groups and ask questions of presenters. Small site and cross-site based groups and the large group discuss students' personal dilemmas elicited through presentations. Personal dilemma discussions help students make meaningful connections and join the two sites into one group as students learn vicariously, collectively, and personally (Gerald Rich, personal communication, March, 2000).

Finally, service learning, requiring 10 hours of community volunteer work, helps students experience the challenges and rewards of improving the quality of life for others. Many times service learning situations present students with experiences that do not fit their "life template". Reflection, both written and verbal, helps students interpret the experiences in light of their personal history and new knowledge (Mezirow, 1990, 1995).

Modifying instructional design and content, according to the program perspectives of transmission, transaction, and transformation, requires students to reflect, integrate, synthesize, and evaluate. Students' dialogue with each other, guest speakers, legislators, community service agency workers as well as users of those services challenge their long held beliefs and interpretations. Through examining issues from competing viewpoints, requiring students to defend and justify their positions, and critically reflecting on influences and impacts on different groups, discourse, a special form of dialogue (Mezirow, 1991, 1994), occurs. Discourse often leads to students articulating positions that are best for everyone, a consensual best judgment (Mezirow, 1994, 1996). When students' views, revised through the reflection process, guide their action, they achieve transformative learning. Such learning and change occurs, however, only within an affective environment of trust, tolerance, freedom, justice, democratic participation, openness, and caring; a context of undistorted communication (Mezirow, 1996). Thus, instructional design requiring critical reflection and the affective environment function interdependently creating in isomorphic fashion, clarity and understanding for students (Taylor, 1997).

Using the framework of transmission, transaction, and transformation, instructional design and content can be altered in ways that improve the teaching/learning process for distance education students and instructors. And, therefore, maintain as well as increase quality educational standards.

**Feedback.** Listening to feedback further creates a positive environment for learning and allows instructors to resolve problems created by the IVN format. With no sound transmission from the remote site until students touched their microphones, a problem of talking between remote site students arose. When all remote site students missed an assignment that had been discussed several times during the previous class, instructors used praxis, a method of formative evaluation, to address the issue.

Praxis, learning by doing or acting on reflection (Mezirow, 1992, 1995; Vella, 1994, 1995), is foundational to the transformative learning process (Mezirow, 1992). Praxis questions are centered in the idea of "what has" and "what is" happening (Vella). Small groups of students described the problem of missed assignments, decided why they thought it was occurring, what problems it caused, and what could be done about it. Students' written responses to the praxis questions were given, via the fax machine from the remote site, and results discussed. In summary, the responses indicated the need for clarification of assignments, validation of work performed, and increased communication between the sites. The praxis activity allowed students to discuss and reflect within a safe environment; to build connections and community (Taylor, 1997).

Thus, listening to student feedback allows instructors to address concerns. Telephone calls between the two sites before and after class as well as during break also helped to clarify assignments with individual students. Remote site students, who could not receive instructors' personal affirmative comments when papers were returned, received many more positive written comments on their papers. In addition, thoroughly discussing the syllabus during the first class and asking for questions about the syllabus at the beginning of the second class alleviated some concerns. Thus, process reflection (Mezirow, 1995) brought about change that improved performance, in parallel fashion, for both teachers and students.

Feedback from receiving site students led to more thorough speaker preparation for the IVN experience. Preventable problems included speakers' eyes appearing closed because they frequently referred to their notes, clothing made of striped fabric that "danced" on the screen and large metal jewelry that reflected the bright lights. Students wearing baseball caps during presentations soon heard from the listeners at the receiving site that "we can't see your eyes" and took off their caps.

Sensitively listening to feedback is essential because the IVN teacher is not physically present at the receiving site to identify and address problematic issues before they escalate (Larson, 1999). When problems surface, the teacher may call the receiving site facilitator and ask for clarification of the problem. For example, "Am I reading the body language correctly, are the students upset about...?" Without a site facilitator, the teacher must talk to students over the air as well as on the telephone. Still, much personal relationship can be lost, or ignored, due to the inability of technology to replace human, affective interaction.

Technology-mediated learning presents unique situations that must be addressed in order to create a true community of learners within the distance education classroom. When instructors plan ways of sensitively listening for feedback and then act to ameliorate problems, the teaching/learning process benefits and quality educational standards are upheld.

***Evaluation.*** The final aspect of creating a community of learners while ensuring quality educational experiences concerns evaluation. Evaluating technology-mediated learning involves both formative and summative evaluations (Rezabek et al., 1995). With formative evaluation, instructors evaluate throughout the course, making changes as necessary in order for students to meet course objectives (Mertens, 1998). Using praxis questions (Vella, 1994) (see Table 3) allows students and instructors to describe, analyze, apply, and implement change. The process of "doing-reflecting-deciding-changing-new doing" (Vella, 1994, p. 12) helps students and instructors re-focus when method or content is incongruent with course objectives. In my many years of teaching, open discussion using the praxis method has never failed to strengthen the teaching/learning process. Thus, the developmental process of formative evaluation is vital, in isomorphic fashion, to both students and instructors.

**Table 3. Praxis Questions**

What do you see happening here?	(Description)
Why do you think it is happening?	(Analysis)
When it happens, what problems does it cause?	(Application)
What can we do about it?	(Implementation)

Note. Vella, 1994, p. 12.



Summative evaluations occur at the end of a course; they provide feedback on effectiveness, useful for future course revisions (Mertens, 1998). For IVN courses, summative evaluations consist of standard university teaching evaluations as well as one IVN-specific and one course-specific technology evaluation. While validity and reliability of evaluation instruments are not available, university administrators place enough confidence in these instruments that results are used for continuance and tenure decisions.

Evaluations of all students taking IVN classes at our university one semester ( $N = 288$ ), indicated that 56% felt the pace of the class was slowed by using IVN equipment (Johnson, 1997). For the majority of capstone class participants (75%,  $N = 32$ ), however, the rate of subject matter presentation was considered "just right". In a related area, 77% of all IVN students ( $N = 297$ ) agreed or strongly agreed that the same amount of material was covered in the IVN class as in a traditional class (Johnson). In addition, capstone class student evaluations ( $N = 32$ ) revealed 23% felt instructional aids were very clear and 95% felt they were very clear or fairly clear.

The author taught the capstone course three times: once in a traditional classroom, once using IVN with a PhD student as course facilitator at the remote site as well as a technology facilitator, and once using IVN with only a technology facilitator at the remote site. Though no significant results were found, interesting comparisons are available. Overall evaluation means on the standard university evaluation forms were similar. The traditional course, taught first, received the highest scores on the 5 point scale ( $M = 4.76$ ,  $N = 35$ ,  $SD = .1102$ ). The IVN with on-site facilitator received the next highest ( $M = 4.67$ ,  $N = 36$ ,  $SD = .1975$ ), and the IVN class with technology facilitator only received the lowest mean score ( $M = 4.41$ ,  $N = 47$ ,  $SD = .1872$ ).

Evaluation of IVN with an on-site course facilitator revealed two items with higher scores than other classes: "Instructor has a genuine interest in students." and "Feedback on examinations/evaluations of work is provided in a timely manner." With a class of 36 split between two sites, the instructors worked together to get to know students by name and work with their individual and group problems. The elevated scores on the two items for the course taught with an on-site facilitator may indicate that the personal element enriches the learning environment. All scores for the IVN class with only a technology facilitator were lower than scores for the other two classes. Possible reasons could include the larger class size, not as much personal attention because an instructor was not present at the remote site, or the group-instructor interaction may have been different for whatever reason.

Responses to 13 IVN-specific class evaluations from one semester ( $N = 298$ ) revealed an overall positive attitude toward the IVN experience ( $M = 95.16$ ,  $SD = 17.91$ , scale range = 26-130). Mean scores on evaluations the previous two semesters were almost identical ( $M = 95.07$ ,  $M = 94.02$ ). As in previous semesters, mean scores from students at the transmitting site ( $M = 96.7$ ) were slightly higher than those from the receiving site ( $M = 92$ ) on the overall evaluation with differences being more pronounced on equipment and instructor format related questions (Johnson, 1997). Overall scores for the IVN class with an on-site facilitator, however, revealed a mean of 90.00 ( $SD = 2.74$ ) for the transmitting site ( $n = 30$ ) and 103.20 ( $SD = 6.08$ ) for the receiving site ( $n = 6$ ). This result could indicate the efficacy of an on-site facilitator. In considering the evaluation results, perhaps combining IVN technology with increased personal interaction would be important. Perhaps instructors need to travel to and broadcast from the remote site at times during the course. To support this suggestion, Gallaher and McCormick (1999) report students feel more connected when they can see an instructor in person. As Merisotis and Phipps (1999) conclude, "It seems clear that technology cannot replace the human factor in higher education" (p. 5).

## Conclusion

Consequently, distance learning requires teachers' focused attention and their willingness to review and revise their teaching methodology. As seasoned instructors, the author and on-site facilitator were aware that evaluation includes self-reflection; therefore, we reviewed the IVN experience using Vella's (1994) praxis questions. The rewards and challenges of team teaching took on new meaning as we reviewed the independent and interactional learning that occurred. We saw students having technology related and non-technology related experiences that would not be possible in the traditional classroom.

Problems encountered required immediate reexamination of teaching fundamentals that expanded our grasp of methodologies useful in technology-mediated classrooms as well as traditional classrooms. We addressed a wider variety of learning styles in an effort to keep students' attention; utilization of such techniques has improved the teaching/learning process in non-technology mediated classes as well. The process of organizing and preparing for classes, accomplished in a more timely manner than when teaching in a traditional classroom, undoubtedly took more time but led to more smoothly running classes and more meaningful learning experiences.

Group work often appeared as a noisy, three-ring circus but objectives were achieved. Each week when class was over, we both felt exhausted because IVN requires intense concentration on the content and process of the course material as well as the technology. Room facilitators who managed the cameras and sound were helpful and pleasant. IVN trainers/support staff patiently explained the technology and helped anticipate problems. They did everything possible to smooth the way for the fearful and ameliorate problems for the frustrated. Our final assessment of IVN suggests, at the affective level, that our perception of IVN changed from apprehension to satisfaction. At the professional level, we believe students achieved course objectives through quality learning experiences; we grew as individuals and teachers. In parallel fashion, then, students and instructors experienced the transformative learning process.

Futurist Donald Norris suggests that technology's role in the future involves working and learning in new ways. Interactivity rather than educational delivery will be the metaphor for learning (Norris, 1997 as cited in Baugher, 1999). Because students and professionals of the future will need to make sense of massive amounts of complex information, effectively training students means focusing on problem-solving skills (Day & Baugher, 1999). Thus, creating a community of learners who build problem-solving skills within distance education classrooms is not only possible but imperative (Roblyer & Ekhaml, 2000). Stressing systemic concepts, instructors can create an environment for learning, modify instructional design and content to fit the situation, listen to feedback, and perform formative and summative evaluation. Such a process promotes the maintenance of quality educational standards. As a result, instructors and students work together to increase dialogue within a trusting environment, critically reflect on the content or on the process of problem-solving, and take action that transforms meaning (Mezirow, 1995). Technology-mediated learning can improve the educational experience for students and teachers.

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