# Creating effective ITV classrooms - factors that affect student learning

Michiko Kobayashi, Ph.D. [kobayashi@suu.edu]

Southern Utah University [http://www.suu.edu]

College of Education

351 West University Boulevard Cedar City

Utah 84720, U.S.A

## Abstract

This article provides a review of past research on K-12 interactive television (ITV) programs in the United States. While the number of web-based distance learning courses is increasing, ITV is still widely used for K-12 learners. ITV allows students to communicate with remote teachers and classmates in real time and to create a learning environment that is similar to face-to-face instruction. The purpose of the article is to examine critical factors for successful interactive television programs and provide suggestions for how educators can best facilitate student learning in ITV environments.

## Keywords

Interactive Television, Interaction, Social presence, Sense of Community

## List of topics



## Introduction

Interactive television (ITV) is one of the oldest delivery methods in K-12 distance learning and teaching (Thomas, 2001). Many researchers have studied ITV classrooms since it was born. ITV provides synchronous instruction that allows students to interact with the remote teacher in real time. As technology advanced, a variety of delivery formats in distance education have become available. Today, the number of web-based distance learning courses for K-12 learners is increasing (Cavanaugh, 2004). While researchers' interests seem to have shifted from ITV to virtual schools (Podoll & Randle, 2005),ITV is still widely used in K-12 schools across the nation (Ely, 2002). U.S. Department of Education has reported that 41 percent of K-12 distance education courses are delivered using ITV (Zandberg, Lewis, & Greene, 2008). As with other form of distance education, sharing qualified teachers in multiple locations is one major advantage of ITV. Because of the lack of qualified teachers, over thirty thousand non-certified teachers in California are teaching in high schools (Follo, Hoerr, & Vorheis-Sargent, 2002). Teacher's professional qualification significantly impacts on student learning (Heck, 2007). ITV can provide quality instruction for such disadvantaged schools in a cost effective way.

Musial and Kampmueller (1996) state that "ITV instructions are not dramatically different from traditional teaching" (p.30). Compared to face to face instruction, no significant disadvantages have been found in learning outcomes (Jucks, Paechter, & Tatar, 2003).Factors that affect student learning in a traditional classroom also affect student learning in an ITV classroom (Kirby, 1998; Martin, 2005). The purpose of this article is to discuss critical factors that affect students' success in ITV classrooms.

## Interaction

Many researchers agree that interaction between the instructor and students, and between students affect student satisfaction with a course, as well as student learning

(Chang & Smith, 2008; Lemak, Reed, & Montgomery, 2005; MacGregor & Atkinson, 2002-2003; Rifkind, 1993). For example, a high level of interaction promotes students' engagement in class activities and also decreases the drop out rate of ITV students (Gillies, 2008).

According to Moore (1989), there are three types of interaction: learner-content interaction, learner-instructor interaction, and learner-learner interaction. He states that the use of a single medium in instruction results in relying on one type of interaction, which in turn, decreases the overall amount of interaction. Additionally, Hillman, Willis, and Gunawardena (1994) have proposed learner-interface interaction, which is a new aspect of interaction that occurs in distance learning delivered using high technology, such as ITV and Internet. According to Hillman et al., successful interaction in distance learning is "highly dependent upon how comfortable the learner feels in working with the delivery medium" (p.32). For example, in the context of ITV, students who do not feel comfortable with using microphones to interact with the instructor and other students may not be involved in the class discussion during live broadcast as much as those who feel comfortable with the system. Larson and Bruning (1996) found that even though microphones are available for live interaction, ITV students feel that they cannot ask questions during broadcast as freely as they do in the regular classroom. Furthermore, Kelsey (2000) identified camera shyness as a factor that interferes with classroom interaction. In her study on two-way compressed video, more than a half of students reported that they feel uncomfortable with asking questions when they are seeing themselves on the TV monitor.

On the other hand, Kruh and Murphy (1990) also proposed four different types of interaction that address

unique characteristics of the ITV environment. They are learner-instructor interaction, learner-learner interaction within a local site, learner-learner interaction across sites, and vicarious interaction (learner intraaction). Vicarious interaction can occur both in distance learning or regular classroom environments. In ITV classrooms, this type of interaction may take place when students see or hear other remote students asking questions that they might have asked, or when students participate in the discussion between remote sites silently. Fulford and Zhang (1993) found that students' vicarious interaction within the class as a group is a critical factor that affects students' satisfaction with ITV courses. Their study showed that perceived overall interaction as a group impacts on student satisfaction more strongly than perceived individual interaction with others. Furthermore, they observed that both perceived level of interaction and students' satisfaction decreased as learners were more exposed to ITV environments. The students' expectation that interaction would increase as they become more familiar with the system and a diminishing novelty effect are mentioned as the main reasons for this. Thus, their study suggests that ITV instructors may need to focus more on overall group dynamics and provide a variety of activities to keep students motivated.

In addition to the perceived level of interaction, MacGregor and Atkinson (2002-2003) stress that the quality of interaction is equally important to enhance student learning. They examined interaction in two-way video ITV classrooms at the college level. The results showed that the highest level of interaction occurs when discussion has a clear focus and the topic is given to students in advance. Also, when teachers help students relate their own experiences to the topic, participation of students is increased. Oliver and McLoughlin (1997) also analyzed different forms of interaction that occur in ITV courses. They divided interaction types into five groups: social, procedural, expository, explanatory, and cognitive interaction. The results showed that the interaction most frequently occurred in ITV is expository, which "involves answers to direct questions, either teacher or student initiated"(p.21). The level of cognitive interaction, such as teacher's feedback, to promote students' reflection was the lowest. They observed that many ITV instructors who participated in the study failed to further the communication to increase understanding and deepen the knowledge after the initial conversation with students. As a result, the duration of each exchange was short and this led to low levels of cognitive interaction. They suggest that while ITV is capable of facilitating cognitive interaction, creating exchanges that are in longer duration with students requires instructors to have skills and experience.

Finally, research shows that remote students tend to have less interaction with instructors than host site students (Sorensen & Baylen, 1999), and they are less involved in class activities (Gillies, 2008; Ritchie & Newby, 1989). Furthermore, students in remote sites perceive that the quality of interaction in remote sites is significantly lower than that of the host site (Lester, 2000). To sum up, all the studies described above suggest that in order to enhance interaction in ITV classrooms, instructors should design lessons carefully considering various aspects that are unique to ITV environments.

## Social Presence

Social presence is one of the critical elements that affect student satisfaction and learning in ITV (Boverie, Gunawardena, Lowe, Murrell, Zittle, & Zittle, 2000). It is defined as "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships"(Short, Williams, & Christie, 1976, p. 65). In the context of ITV, social presence refers to the degree of emotional closeness between the instructor and students, and among students across sites (Boverie et al., 2000).

Short et al. (1976) state that although social presence can affect the way people perceive their communication, it is "a quality of the medium, itself" (p.65). Thus, the level of social presence varies depending on the media. They compared the social presence of different media including face-to face, television, multi-speaker audio system, telephone, and business letters. The results showed that the levels of social presence in visual media are much higher than those in non-visual media. The social presence of face-to face communication was the highest, whereas business letters were the lowest. Television was ranked second, but the difference between face-to-face and television was significant. Multi-speaker audio systems were significantly higher on social presence than telephones. Short et al. (1976) also found that the size of the picture on the screen contributed to social presence of the visual media. The media with higher social presence were viewed as being more active rather than passive.

Based on their study, the social presence of ITV is assumed to be higher than those of text-based online courses. Among the ITV delivery formats, the level of social presence also can vary. One-way video systems are lower on social presence than two-way video format because two-way video provides visual communication channels for both the instructor and students, which is closer to face-to-face communication. Similarly, the use of compressed video and desktop videoconferencing systems is more likely to be lower on social presence than instruction using a full motion video. In addition, since students who view the class on tape due to schedule conflicts are unable to interact with the instructor and other remote students during live class broadcasts, they receive instruction more passively. Therefore, the social presence perceived by tape-delayed students is expected to be lower than the social presence perceived by students who participate in live classes.

It is important to note that the level of social presence with two-way video is not the same as the social presence of face-to face. Even with a two-way video system, depersonalized instruction occurs because of a lack of physical contact with remote site students. In such environments, students tend to see other students as objects on the screen and enter a "passive 'television watching' mode" (Hakes, Cochenour, Rezabek, & Sachs, 1995, p.134). MacGregor and Atkinson (2002-2003) further emphasize that although a two-way video format provides a visual connection between the instructor and students, the face-to-face contact is still mediated. As a result the number of communication channels such as eye contact and facial expressions is reduced, which creates a lower level of social presence.

According to Short et al. (1976), immediacy is related to social presence. Wiener and Mehrabian (1968) originally defined immediacy as "the degree of directness and intensity of interaction," which people perceive through verbal communication (p. 4). Later, the definition was expanded and researchers used the term "teacher immediacy" to describe teachers' verbal and non-verbal behaviours that minimize psychological distance between the instructor and the students (Gorham, 1988). The verbal immediacy behaviours include "actions such as using personal examples, using humour, addressing students by name, praising students, and initiating discussion" etc. (Hackman & Walker, 1990, p.200). The non-verbal immediacy behaviours include "gesturing, smiling, maintaining a relaxed body position, using vocal variety, and touching" etc. (p.200). By using immediacy behaviours, an instructor can create a warm and risk taking learning environment, and reduce student anxiety in remote sites (Hakes et al., 1995). MacGregor and Atkinson (2002-2003) stress that teacher immediacy increases interaction in ITV classrooms.

Richmond, Gorham, and McCroskey (1987) studied the effects of teachers' non-verbal behaviours in a

regular college classroom. Vocal expressiveness, smiling, and relaxed body position significantly influenced students' cognitive learning. Furthermore, verbal immediacy behaviour also affected both students' affective and cognitive learning (Gorham, 1988). His study showed that as class size increases, a teacher's self-disclosure, encouraging students' participation or asking questions, referring to class as "our" class, instead of "this" class, all become important factors for student learning. This suggests that in ITV with a large class size, such as satellite-based programs, instructors may need to use teacher immediacy more consciously in their lessons.

Hackman and Walker (1990) examined teacher immediacy in an ITV classroom. Their study results were consistent with the above research conducted in a more traditional face to face classroom setting. Among teacher immediacy behaviours, individual attention, encouragement to remote site students, and use of vocal variety were highlighted as the most critical factors in promoting student satisfaction and learning. In addition, their study revealed that teacher immediacy behaviours impact on student perceived system effectiveness such as "the clarity of audio/visual transmission, the technical ease of remote participation, and information transfer" (p.200). For example, students found it easier to hear when instructors maintained a relaxed posture and used a variety of vocal expressions. Instructors' humour and smile also enhanced perceived information exchange. Their study clearly suggests that teacher immediacy influences a student's perceived quality of media, that is, social presence.

In addition to immediacy, intimacy is also related to social presence (Short et al., 1976). According to Argyle and Dean (1965), the level of intimacy between two people is determined by equilibrium of various components, including eye contact, physical distance, intimacy of topic, amount of smiling, etc. Short et al. (1976) state that social presence also affects intimacy. In ITV classrooms, the lack of eye contact is often described as one of the major disadvantages (MacGregor & Atkinson, 2002-2003). Physical distance between the instructor and remote students is inevitable. Tape delayed students may perceive a lower level of social presence. Thus, the theory of intimacy suggests that to maintain the optimum equilibrium other components must compensate for the deficiency of those elements.

Saenz and Lockee (2004) state that interaction affects social presence. As mentioned earlier, student attitudes towards a medium can influence the level of social presence (Short et al., 1976). Since students' positive attitude towards courses is associated with the amount of interaction (Morehouse, Hoaglund, & Schmidt, 1987), the more interaction takes place using a medium, the more positive attitude students may have toward the medium. As a result, the level of social presence increases.

In summary, social presence impacts on student learning in ITV classrooms. To enhance social presence, instructors should increase the use of teacher immediacy and interaction. Social presence, teacher immediacy, and interaction can also develop intimacy between the instructor and students, which in turn minimizes negative effects of physical and psychological distance.

## Instructor's Effectiveness

Cyrs and Conway (1997) stipulate that ITV instructors should have effective verbal and nonverbal communication skills. Not only communication during the session on TV, but also communication outside the classroom is important. A variety of media such as email, fax, telephone, and printed materials should be used on a regular basis as a communication tool (Anderson & Kent, 2002; Clifford, 1990).

Generally, distance learning requires advance preparation and more time for designing and developing courses (Cyrs & Conway, 1997). Thus, strong organization skills are required. Moreover, creativity is critical for successful ITV programs (Gerstein, 2000). Providing a variety of activities is important (Sorensen & Baylen, 1999). For example, occasional group activities within a site (Tykwinski & Poulin, 1991) and opportunities to work together across sites allow students to learn multiple perspectives and obtain feedback from others (Squire & Johnson, 2000).

Pacing has also been mentioned is as an important factor for sustained interest and attention of remote site students (Tykwinski & Poulin, 1991). While students have said that ITV instruction moves faster than regular classroom instruction and does at times make it difficult to catch up (Harris, 1997), slow paced instruction has had a negative impact on student attention and interest.The lengthy lecture type presentation, the slow pace of instruction, and the lack of entertaining elements lead to students being less attentive to the class presentation (Kubota, 1999; Martin 2005). Thus, ITV instructors should "make broadcast instruction as entertaining and attractive as possible for the young TV generation," as well as pay attention to the pace of instruction (Kubota, 1999, p.339). It has also been suggested that instructors should make efforts to provide relevant and useful activities that can help students achieve their personal learning goals in order to increase student motivation (Oxford, Park-Oh, Ito, & Sumrall, 1993).

Moore and Thompson (1990) emphasize the importance of the use of printed materials in distance learning environments. Printed materials can enhance student learning as much as graphics or audio materials created using computer software. According to Cyrs and Conway (1997), many students have poor note-taking skills. Especially in an ITV environment, students have experienced more difficulties in note-taking during the televised presentation and seemed "less interest in topics presented" on TV (Denton, Clark, Rossing, & O'Connor, 1984-85, p.297).Moreover, Offir, Bezarel, and Barth (2007) report that introvert students tend to feel a high level of tension during broadcasts because they feel that they must write down every single word spoken by the instructor. The provision of class handouts can help direct students' attention to key concepts of the lesson (Cyrs, & Conway, 1997) and reduce their anxiety for missing important materials (Offir et al., 2007).

It has also been stressed that ITV instructors "should be familiar with television technology" (Cyrs, & Conway, 1997, p.211). Instructor's knowledge of the system greatly enhances the presentation and can minimize any problems that arise (Lester, 2000; Anderson & Kent, 2002). For example, if a problem with audio, computer display or overhead cameras occurs during live broadcast, instructors may not be able to use some materials prepared for the lesson. Thus, ITV instructors need to be more flexible and should always have a backup plan in case the technology fails them (Levitch & Milheim, 2003).

In addition, the use of effective feedback techniques is important to provide support for individual learners and to monitor progress (McKenzie, Witte, Guarino, & Witte, 2002; Moore & Thompson, 1990). In ITV with a one-way video system, non-verbal cues from students such as facial expressions are not available. Even with two-way video format, visual communication channels are limited (MacGregor & Atkinson, 2002-2003). Therefore, another system to obtain student feedback needs to be built into the course (Purcell & Purcell, 2000). Effective feedback, which is "prompt, focused, and constructive" (Repman & Roganm 1996, p.37), can promote student participation, enhance their motivation (Store & Armstrong, 1981), and minimize psychological distance (Purcell & Purcell, 2000). The promptness of returning graded papers also increases students' satisfaction and significantly affects their academic performance (Biner & Dean, 1995; Lemley, Sudweeks, Howell, Laws, & Sawyer, 2006).

Finally, Barker (1991) maintains that distance education teachers should understand and model principles of effective teaching, and know how to best use the telecommunication medium to deliver their instruction. A recent study has revealed that while most ITV instructors receive technical training on how to use the equipment, few are provided with pedagogical training on creating effective ITV classrooms (Anderson, 2008). Especially in ITV environments, instructors' ability "to articulate, pace, image, and personalize" has been underlined (Cyrs, & Conway, 1997, p.211). Instructors' behaviours seem to have comparatively higher impact in ITV classroom more than in regular classrooms (Optiz, 1996). Thus, ITV instructors should use corresponding strategies carefully, and always be well prepared for a lesson.

## Sense of Community

In order to increase student participation, an instructor should "create an atmosphere that encourages questions and promote a sense of community" among learners (Levitch & Milheim, 2003, p.45). A sense of community contributes to the quality of interactions, which in turn, facilitates student learning. Rovai and Lucking (2003) have found that a sense of community among ITV students is significantly lower than that of regular classroom students. Other studies also show that many of the high school students in ITV classrooms do not feel they are part of a larger group (Learmont, 1990). Especially, remote students often express a feeling of exclusion (Lester, 2000; MacGregor & Atkinson, 2002-2003).

Sarason (1974) first introduced the theory of sense of community. Based on the theory, MacMillan and Chavis (1986) described elements involved in a sense of community: membership, influence, integration, fulfilment of needs, and shared emotional connection. Later, those elements were rearranged and renamed as spirit, trust, trade, and art (MacMillan, 1996). Spirit consists of three categories: emotional safety, boundaries, and sense of belonging. To create a community, people must feel safe to tell "the truth" to other members. Boundaries develop such emotional safety and provide "the logistical time/place settings for a group or to be a group" (MacMillan, 1996, p.317). Boundaries define who belongs to a community and who does not. Acceptance, caring, and recognition by a community promote emotional safety and sense of belonging. Trust involves shared responsibility and shared authority. To develop trust, each member of a community must know what they are expected to do in the community, and share authority among members. Once trust has been established, a community begins to trade. Self-disclosures are the media of trade. When people trust each other and find a social setting where they feel safe from shame, they begin to share their feelings with each other. Finally, art refers to shared experiences and it is essential for developing a community. To share experiences among members, contact and high quality of interaction are required (MacMillan, 1996).

The communities that influence people most are not necessarily connected within the same geographical location (Hill, 1996). This suggests that it is possible to develop a higher level of sense of community in an ITV environment where remote sites are spread in different geographical areas, even across the nation. Furthermore, Hill states that psychological sense of community is setting-specific. What aspect of communities can facilitate a sense of community varies depending on the context. Factors promoting a sense of community in ITV classrooms are assumed to be different from those in regular classrooms. Even within ITV, characteristics of individual programs including students' age, content areas, the number of sites involved, and one-way or two-way video are different. Consequently, educators may need to consider the uniqueness of an individual ITV program in order to facilitate a sense of community.

Several techniques to increase a sense of community in ITV classroom have been recommended among which the use of teacher immediacy (MacGregor & Atkinson, 2002-2003; Rifkind, 1993). Since teacher immediacy enhances personalized instruction, it is certainly effective to increase the level of "emotional safety" and "sense of belonging" described by MacMillan (1996). As suggested earlier, instructors who use immediacy techniques can promote relationships with remote students and decrease psychological distance between instructors and students (Hackman & Walker, 1990).

Collaborative learning is another effective way to develop a sense of community. Many researchers emphasize the importance of collaborative learning to increase student interaction (Cavanaugh, 1999, Levitch & Milheim, 2003). Oliver and McLoughlin's 1997 study shows that the interactions that take place "in a supportive and collaborative context" promote students' thinking and reflection in the learning process (p.11). Collaborative learning provides an environment where students receive social support from each other. In such an environment, using the terms defined by MacMillan (1996), learners become able to build "trust", and facilitate "trade" and "art" among themselves. In addition, when distance students learn collaboratively with peers, dropout rates tend to decrease (Levitch & Milheim, 2003).

Similarly, a learner-cantered classroom facilitates rapport among students (Smyth, 2005; Walcott, 1996) and produces the high quality of student outcomes (Miller, 2007). In a learner-centred classroom, students become less dependent on the instructor. As a result, interaction among students increases (Levitch & Milheim, 2003) and they become more involved in class activities (Squire & Johnson, 2000). In a learner-centred classroom, instructors are facilitators for student learning (Purcell & Purcell, 2000). As a member of the classroom community, instructors provide demonstration, feedback, and guidance (Squire & Johnson, 2000).

Finally, Pretty, Conroy, Dugay, and Fowler (1996) mention that social support can facilitate a sense of community, but it is not necessarily dependent upon actual experience. If people feel that social support is available to them when they are needed, such perceptions can promote a sense of community. Individuals' perception of a sense of community also affects acceptance of social support. If adolescents feel that they are not accepted as members of a community, "they may choose not to access the resources and opportunities afforded by the community" (p.368). Research on ITV classrooms shows that while a toll-free number is provided to interact with the instructor for asking questions or receiving learning guidance, many ITV students do not use this system because they are not comfortable with calling (Kirby, 1998). This may indicate that those ITV students did not use such support systems because they felt that they were not accepted as members of the group. In other words, they did not perceive "a sense of community."

## Classroom Facilitators

Classroom facilitators play an important role in ITV programs (Boverie, Murrell, Lowe, Zittle, Zittle, & Gunawardena, 1997; Hakes et al., 1995; Holt, 1992; Kirby, 1998; MacGregor & Atkinson, 2002-2003; Moore et al., 1990; Willis, 1992; Yi & Majima, 1993). The maturity level of K-12 learners is obviously different from that of adult students. Therefore, the same level of self-discipline cannot be expected for K-12 distance learners. They need more support and learning guidance from adults (Boverie et al., 1997).

One of the most important roles of the facilitator is to mediate between the instructor and students to reduce psychological distance between them (Willis, 1992; Yi & Majima, 1993). Researchers suggest that

facilitators and instructors should establish "a close working relationship" (Yi & Majima, 1993, p.28) and work as a team (Boverie et al., 1997). Facilitators should be a mentor, or the role model that shows students how to participate in the class (MacGregor & Atkinson, 2002-2003). They must know how to bring enthusiasm to students (Hakes et al., 1995). Reminders and encouragements by facilitators are important for remote site students. Especially, when a large number of sites are involved, interaction decreases, and the facilitators' role becomes more important (MacGregor & Atkinson, 2002-2003). Yi and Majima (1993) also found that facilitators' active involvement and commitment affects their relationship with the learners. "The uneasy relationship between facilitator and students" cause students' negative attitudes towards the course, which in turn affect their learning (p.26).

As the finding presented above indicate, for students to be successful in ITV classrooms, a facilitator's role should not be limited to routine responsibilities such as turning on and off the TV, taking attendance, taping classes, distributing materials, posting test or quiz schedules, etc. However, many school administrators often perceive facilitators' roles as technical assistants who carry out routine clerical work (Yi & Majima, 1993). Because of such misconceptions, school administrators tend to select whoever is available. As a result the quality of facilitators and their level of involvement vary considerably across sites. Some schools select teachers of the content areas of the ITV courses as facilitators, whereas other schools select teachers outside the content areas, librarians, and school secretaries (Anderson, 2008; Moore et al. 1990). Having facilitators who are knowledgeable in the content areas as has been perceived as a great advantage by learners because they feel that they can understand the class content better with their facilitator's help (Larson & Bruning, 1996). On the other hand, even if facilitators are not able to answer students' questions about the content area, students feel that facilitators help them keep on track with their class work (Yi & Majima, 1993).

One reason for the disparity in facilitator quality is that selecting teachers in the content areas of the ITV courses is not always possible (Yi & Majima, 1993). Many remote sites may not be able to find teachers in the content areas that are less commonly taught at schools. Even selecting teachers outside the content areas for facilitators may be difficult for some schools. Because of teacher shortage in public schools (Follo et al., 2002) all full-time teachers may already be assigned for other school related responsibilities in addition to teaching their own classes. Thus, schools may have to recur to other available school personnel who can at least take care of routine work. Kirby (1998) observed that even school administrators such as assistant principals act as facilitators. In such cases, due to other responsibilities as administrators, they are often unable to be present in the classroom during broadcasts. Since they are administrators, no substitute fills in the position when they miss the class. Absence of facilitators in the classroom significantly affects student learning. High school students taking a satellite program have experienced more difficulties in concentrating in the ITV classroom than in a regular classroom (Levine, 1989). Yet, when facilitators are not present in the classroom, students find it even more difficult to pay attention to the presentation (Kirby, 1998) and tend to talk with classmates during broadcasts (Robinson & West, 1986). A facilitator's function becomes even more important when students view the class on tape-delay (Moore et al., 1990). This indicates that the absence of facilitators' physical presence in the ITV classroom may impact more on tape-delayed students than on students who view the live class.

In summary, both instructors and facilitators need to be aware of the importance of facilitators in the ITV classroom and work cooperatively to enhance student learning. Remote schools should ensure a facilitator's quality to increase student success in ITV courses. Especially, students who are less motivated and lack self-discipline skills need more support from facilitators. If those students are forced to view the class on tape due to scheduling conflicts, a facilitator's physical presence is highly recommended.

## Technical Support

Technical difficulties can lead to student frustration and dissatisfaction with the course (Anderson & Kent, 2002; Learmont, 1990; Lester, 2000). In ITV environments, poor audio quality is one of the major technical problems that hinder interaction, which in turn affects student learning (Azin-Manley & Olson, 1997). An audio echo is often inevitable when remote students talk back using telephones to interact with the instructor during live broadcasts (Barker, 1991). This makes it difficult for remote students to hear conversation through the TV. In order to minimize such problems, each local site should have a separate technical support person other than facilitators (Azin-Manley & Olson, 1997). This seems particularly important if the program is delivered using a two-way video system such as compressed video as more technical knowledge may be required to fix problems.

Kubota (1999) reported that the school participated in her study often had a problem with taping the broadcast. Sometimes, the beginning part of the program was cut off and the audio quality was poor. Azin-Manley and Olson (1997) have observed an interrelationship between student drop out numbers and frequent technical problems. Their study illustrates that learners who were in the course with the highest drop out rate tended to have more technical problems. When schools had problems with receiving transmission, it often took 20 to 25 minutes for the system to be repaired. Consequently, students wasted class time. Thus, in ITV classrooms, technical difficulties can cause a long duration of "down time" in remote sites (Robinson & West, 1986). Without any doubt, such down time period can affect student attitude and motivation, especially low achieving students who tend to be less motivated from the outset of a course. Research confirms that as a result of technical hitches, "even the best of students tended to become discouraged and had trouble refocusing on the course once the technical problems were overcome" (Roblyner & Marshall, 2002-2003, p.252). Thus, having trained technical staffs available for remote schools is critical in ITV classrooms. It is equally important that each local school has reliable equipment and should not neglect the regular maintenance.

In addition, inconsistency of the audio signals ranging from weak to loud has caused learners anxiety and distracts them from the presentation (MacGregor & Atkinson, 2002-2003). As described earlier, students' perceptions of visual and audio quality can affect a level of social presence (Short et al., 1976). Thus, technical staffs at the host site should be well trained and knowledgeable of the effects of the audio and visuals on reception sites.

## Summary

The factors discussed in this article are interrelated. Instructors' effectiveness and quality of facilitators affect interaction, social presence, and sense of community. Technical problems impact on a student's motivation to keep up with the class work. Moreover, administrative support has been shown to be indispensable for making the entire ITV system work effectively. Selecting quality facilitators, providing technical workshop opportunities, and arranging technical support are administrators' roles (Cambre & Hawkes, 2001). Willis (1992) observed that "effective distance education requires the integrated efforts of several participant groups, including students, faculty, facilitators, support staff, and administrators" (p.35). The research on ITV classrooms presented and summarized in this article confirms the validity of

his statement. In order to increase student success in ITV classrooms all parties involved need to cooperate and make a conscious effort to create an effective learning environment.

## References


[1] Anderson, L. P., & Kent, C. A. (2002). Interactive televised courses: student perceptions of teaching effectiveness, with recommendations. *College Teaching, 50*(2), 67-74.

[2] Anderson, T. (2008). Is videoconferencing the killer app for K-12 distance education? *Journal of Distance Education, 22*(2), 109-124.

[3] Argyle, M., & Dean, J. (1965). Eye contact, distance, and affiliation. *Sociometry, 28*(3), 289-304.

[4] Azin-Manley, M., & Olson, C. (1997). *The governor's pilot distance learning project: The experiences of four Wyoming schools.* Jackson, WY: Board of cooperative educational services (ERIC Document Reproduction Service No. ED417877)

[5] Barker, B. O. (1991, April). *K-12 distance education in the United States: Technology strengths, weaknesses, and issues.* Paper presented at the annual international conference on distance learning association, Washington, DC. (ERIC Document Reproduction Service No. ED332687)

[6] Biner, P. M., & Dean, R. S. (1995). Re-assessing the role of student attitudes in the evaluation of distance education effectiveness. *The Distance Educator, 1*(3), 8-9.

[7] Boverie, P., Gunawardena, C. N., Lowe, C. A., Murrell, W. G., Zittle, R. H., & Zittle, F. (2000). Designing satellite instruction for elementary students; Importance of the classroom teacher. *International Journal of Educational Telecommunications, 6*(2), 107-122.

[8] Boverie, P., Murrell, W. G., Lowe, C. A., Zittle, R. H., Zittle, F., & Gunawardena, C. N. (1997). *Live vs. Taped: perspectives in satellite-based programming for primary grades.* Albuquerque, NM: University of New Mexico. (ERIC Document Reproduction Service No. ED407939)

[9] Cambre, M., & Hawkes, M. (2001). Twelve steps to a telecommunity. *Learning and Leading with Technology, 28*(6), 22-27.

[10] Cavanaugh, C. S. (1999). *The Effectiveness of Interactive Distance Education Technologies in K-12 Learning: A meta analysis.* Tampa, FL: University of South Florida. (ERIC Document Reproduction Service No. ED430547)

[11] Cavanaugh, C. S. (2004). *Development and Management of Virtual Schools: Issues and Trends.* Hershey, PA: Information Science Publishing.

[12] Chang, S. H., & Smith, R. A. (2008). Effectiveness of personal interaction in a learner-centered paradigm distance education class based on student satisfaction. *Journal of Research on Technology in Education, 40*(4), 407-426.

[13] Clifford, R. (1990). *Foreign languages and distance learning: the next best thing to being there.* Eric Digest. (ERIC Document Reproduction Service No. ED327066)

[14] Cyrs, T. E., & Conway, E. D. (1997). *Teaching at a distance with the merging technologies: An instructional Systems Approach.* Center for Educational Development, New Mexico State University.

[15] Denton, J. J., Clark, F. E., Rossing, R. G., & O'Connor, M. J. (1984-1985). Assessing instructional strategies and resulting student attitudes regarding two-way television instruction. *Journal of Educational Technology Systems, 13*(4), 281-298. *Directory of Distance Learning Opportunities: K-12*. (2003). Westport, CT: Greenwood Press.

[16] Ely, D. P. (2002). *Trends in educational technology*. Eric clearing house on Information and Technology. (ERIC Document Reproduction Service No. ED477511)

[17] Follo, E., Hoerr, B., & Vorheis-Sargent, A. (2002). Where will urban high school teachers for the 21st century come from? *American Secondary Education, 30*(3), 2-22.

[18] Fulford, C. P., & Zhang, S. (1993). Perceptions of interaction: the critical predictor in distance education. *The American Journal of Distance Education, 7*(3), 8-21.

[19] Gerstein, R. B. (2000). Videoconferencing in the classroom: Special projects toward cultural understanding. *Computers in the Schools, 16*(3/4), 177-186.

[20] Gillies, D. (2008). Student perspectives on videoconferencing in teacher education at a distance. *Distance Education, 29*(1), 107-118.

[21] Gorham, J. (1988). The relationship between verbal teacher immediacy behavior and student learning. *Communication Education, 37*, 40-53.

[22] Hackman, M. Z., & Walker, K. B. (1990). Instructional communication in the televised classroom: the effects of system design and teacher immediacy on student learning and satisfaction. *Communication Education, 39*(3), 196-209.

[23] Hakes, B., Cochennour, J. Rezabek, L. L., & Sachs, S. G. (1995). *Compressed video for instruction: Operations and applications.* Washington, D.C.: Association for Educational Communications & Technology.

[24] Harris, D. (1997). Interactive satellite television evaluation project. Wellington, New Zealand: New Zealand Council for Educational Research. (ERIC Document Reproduction Service No. ED422902)

[25] Heck, R. H. (2007). Examining the relationship between teacher quality as an organizational property of schools and students' achievement and growth rates. *Educational Administration Quarterly, 43*(4), 399-432.

[26] Hill, J. L. (1996). Psychological sense of community: suggestions for future research. *Journal of Community Psychology*, 24(4), 431-438.

[27] Hillman, D. A., Willis, D. J., & Gunawardena, C. N. (1994). Learner-interface interaction in distance

education: An extension of contemporary models and strategies for practitioners. *The American Journal of Distance Education, 8*(2), 30-42.

[28] Jucks, R., Paechter, M. R. & Tatar, D. G. (2003). Learning and collaboration in online discourses.*International Journal of Educational Policy, Research & Practice, 4*(1), 117–146.

[29] Kelsey, K. D. (2000). Participant Interaction in a course delivered by interactive compressed video technology. *The American Journal of Distance Education, 14*(1), 63-75.

[30] Kirby, E. (1998, March). Strategies to support effective distance education programs in high schools. Paper presented at SITE 98: Society for Information Technology & Teacher Education International Conference, Washington, DC. (ERIC Document Reproduction Service No. ED421102)

[31] Kruh, J. J., & Murphy, K. L. (1990, October). Interaction in teleconferencing the key to quality instruction. Paper presented at the 12th annual rural and small schools conference, Manhattan, KS. Kansas State University. (ERIC Document Reproduction Service No. ED329418)

[32] Kubota, R. (1999). Learning Japanese via satellite in an American high school: A case study. *Foreign Language Annals, 32*(3), 329-341.

[33] Larson, M. R., & Bruning, R. (1996). Participant perceptions of a collaborative satellite-based mathematics course. *The American Journal of Distance Education, 10*(1), 6-22.

[34] Learmont, D. (1990). *Affective differences between host-site and remote-site distance learners participating in two-way interactive television classrooms for high school course credit*. Unpublished doctoral dissertation, Wayne State University. MI.

[35] Lemak, D. J., Reed, R., & Montgomery, J.C. (2005). Technology, transactional distance, and an empirical investigation. *Academy of Management Learning & Education, 4*(2), 150-159.

[36] Lemley, D., Sudweeks, R., Howell, S. R., Laws, D., & Sawyer, O. (2006). The effects of immediate and delayed feedback on secondary distance learners. *The Quarterly Review of Distance Education, 8*(3), 251-260.

[37] Lester, M. A. (2000). *What students said about interactive video instruction: Results of two surveys conducted by the West Suburban Post-Secondary Consortium*. Oak Brook, IL: West Suburban Higher Education Consortium. (ERIC Document Reproduction Service No. ED459685)

[38] Levine, T. L. (1989). SERC passes pilot semester test. *TechTrends, 34*(6), 16-19.

[39] Levitch, S., & Milheim, W. D. (2003, March/April). Transitioning instructor skills to the virtual classroom. *Educational Technology*, 42-46.

[40] MacGregor, S. K., & Atkinson, T. R. (2002-2003). Facilitating learning interactions in the two-way video classroom. *Journal of Educational Technology Systems, 31*(1), 45-62.

[41] MacMillan, D. W. (1996). Sense of community. *Journal of Community Psychology, 24*(4), 315-325.

[42] MacMillan, D. W., & Chavis, D. M. (1986). Sense of community: A definition and theory. *Journal of Community Psychology, 14*(1), 6-23.

[43] Martin, M. (2005). Seeing is believing: the role of video conferencing in distance learning. *British Journal of Educational Technology, 36*(3), 397-405.

[44] MacKenzie, B. K., Witte, J. E., Guarino, A. J., & Witte, M. M. (2002). Interactive television (ITV) instructor behaviors: implications of frequency and importance. *Innovative Higher Education, 27*(1), 65-73.

[45] Miller, C. (2007). Enhancing web-based instruction using a person-centered model of instruction. *The Quarterly Review of Distance Education, 8*(1), 25–34.

[46] Moore, D. M., Dodl, N. R., & Burton, J. K. (1990). *A Descriptive Study of Virginia Electronic Classroom Program*. Blacksburg, VA: College of Education, Virginia Polytechnic Institute and State University.

[47] Moore, M. G. (1989). Three types of interaction. *The American Journal of Distance Education, 3*(2), 1-6.

[48] Moore, M. G., & Thompson, M. M. (1990). *The Effects of Distance Learning: A summary of literature*. Southeastern Ohio Telecommunications Consortium. (ERIC Document Reproduction Service No. ED330321)

[49] Morehouse, D. L., Hoaglund, M. L., & Schmidt, R. H. (1987). *Interactive Television Findings, Issues, Recommendations: An Analysis Based on Evaluation of Minnesota's Technology Demonstration Program*. Minneapolis: Tele-Systems Associates.

[50] Musial, G. G., Kampmueller, W. (1996). Two-way video distance education: Ten misconceptions about teaching and learning via interactive television. *Action in Teacher Education, 17*, 28-36.

[51] Offir, B., Bezarel, R., & Barth, I. (2007). Introverts, extroverts, and achievement in a distance learning environment. *American Journal of Distance Education, 21*(1), 3-19.

[52] Oliver, R., & McLoughlin, C. (1997). Interaction patterns in teaching and learning with live interactive television. *Journal of Educational Media, 23*(1), 7-24.

[53] Optiz, M. (1996). Interactive distance learning: Implications for the classroom teacher. *The Clearing House, 69*(6), 325-326.

[54] Oxford, R., Park-Oh, Y., Ito, S., & Sumrall, M. (1993). Japanese by satellite: Effects of motivation, language learning styles, previous language learning experience on Japanese language achievement. *Foreign Language Annals, 26*(3), 359-370.

[55] Podoll, S., & Randle, D. (2005). Building a virtual high school – click by click. *T H E Journal, 33*(2), 14-19.

[56] Pretty, G. M., Conroy, C., Dugay, J., Fowler, K., & Williams, D. (1996). Sense of community and its relevance to adolescents of all age. *Journal of Community Psychology, 24*(4), 365-379.

[57] Purcell, R. M., & Purcell, D. F. (2000). *Interactive Distance Learning in Distance Learning Technologies: Issues, Trends, and Opportunities*. Hershey, PA: Idea Group Publishing.

[58] Repman, J. & Logan, S. (1996). Interactions at a distance: Possible barriers and collaborative solutions. *TechTrends, 41*(6), 35-38.

[59] Richmond, V., Gorham, J. S., & McCroskey, J. C. (1987). The relationship between selected immediacy behavior & cognitive learning. In M. McLaughlin (Ed.), *Communication Year Book 10*, (pp. 574-590).

[60] Rifkind, L. J. (1993). Immediacy as a predictor of teacher effectiveness in the instructional television classroom. *The Journal of Interactive Television*, 1(1), 31-40.

[61] Ritchie, H., & Newby, T. J. (1989). Classroom lecture/discussion vs. Live televised instruction: A comparison of effects on student performance, attitude, and interaction. *The American Journal of Distance Education, 3*(3), 36-45.

[62] Robinson, R. S., & West, P. C. (1986). *Interactive cable television: An evaluation study*. Paper presented at the joint conference of the Canadian Vocational Association and the Association of Canadian Community Colleges, Vancouver, British Columbia.

[63] Roblyer, M. D., & Marshall, J. C. (2002-2003). Predicting success of virtual high school students: Preliminary results from an educational success prediction instrument. *Journal of Research on Technology in Education, 35*(2), 241-255.

[64] Rovai, A. P., & Lucking, R. (2003). Sense of community in a higher education television-based distance education program. *Educational Technology Research and Development, 51*(2), 5-16.

[65] Saenz, B. L., & Lockee, B. B. (2004). Examining social presence in an online master's degree program. In M. Orey, M.A. Fitzgerald, & R. M. Branch (Eds.), *Educational Media And Technology Yearbook 2004 Vol. 29*, (pp. 119-131). Westport, CT: Liblares Unlimited.

[66] Sarason, S. B. (1974). *The Psychological Sense of Community: Prospectus for A Community Psychology*. San Francisco: Jossey Bass.

[67] Short, J., Williams, E., & Christie, B. (1976). *The Social Psychology of Telecommunications*. London: John Wiley & Sons.

[68] Sorensen, C., & Baylen, D. M. (1999). *Interaction in interactive television instruction: Perception versus reality*. Paper presented at the 1999 conference of the American Educational Research Association, Montreal, Canada. (ERIC Document Reproduction Service No. ED429590)

[69] Smyth, R. (2005). Broadband videoconferencing as a tool for learner-centered distance learning in higher education. *British Journal of Educational Technology, 36*(5), 805-820.

[70] Squire, K. D., & Johnson, C. B. (2000). Supporting distributed communities of practice with interactive television. *Educational Technology Research and Development, 48*(1), 23-43.

[71] Store, R. E., & Armstrong, J. D. (1981). Personalizing feedback between teacher and student in the context of a particular model of distance teaching. *British Journal of Educational Technology, 12*(2), 140-156.

[72] Thomas, W. M. (2001). *Electric Delivery of High School Courses: Status, Trends, and Issues*. Atlanta, GA: Southern Regional Education Board. (ERIC Document Reproduction Service No. ED459689)

[73] Tushnet, N. C., & Fleming-MacCormick, T. (1995). Equity issues in the Star Schools distance learning program. *Journal of Educational Computing Research, 13*(2), 173-83.

[74] Tykwinski, J. R., & Poulin, R. C. (1991). *North Dakota interactive video network: A practical guide to teleconferencing and distance education*. Bismarck, ND: North Dakota University System. (ERIC Document Reproduction Service No. ED348945)

[75] Wiener, M., & Mehrabian, A. (1968). *Language within Language: Immediacy, A Channel in Verbal Communication*. New York: Appleton-Century-Crofts Meredith corporation.

[76] Willis, B. (1992, June). From a distance: Making distance learning effective: Key roles and responsibilities. *Educational Technology*, 35-37

[77] Wolcott, L. L. (1996). Distant, but not distanced: A learner-centered approach to distance education. *TechTrends, 41*(4), 23-37.

[78] Yi, H., & Majima, J. (1993). The teacher-learner relationship and classroom interaction in distance learning: A case study of the Japanese language classes at an American high school. *Foreign Language Annals, 26*(1), 21-30.

[79] Zandberg, I, Lewis, L., & Greene, B. (2008). *Technology Based Distance Education Courses for Public Elementary and Secondary Schools: 2002-03 and 2004-05*. National Center for Educational Statistics US Department of Education. Retrieved August 3, 2008 from http://nces.ed.gov/pubs2008/2008008.pdf