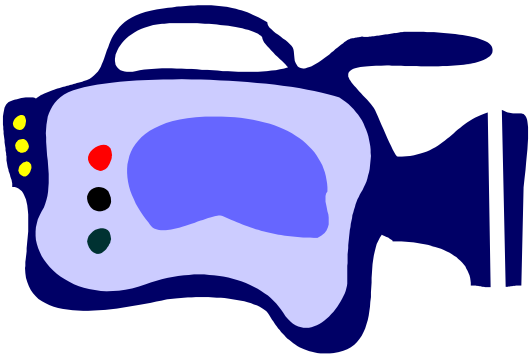

The Impact of Video Technology in Education: From Here to Where?

A Review of the Literature by Sonia Jurich

Why Video Technology

Children are growing up in a world continuously besieged by visual stimuli coming from devices such as television, videos and, more recently, computers. Although this exposure is marred by complaints from parents and adults in general, Neisser (1997) suggests that it may be one of the factors behind the ongoing worldwide rise in intelligence scores. The fast and ever growing popularity of visual media around the world can be explained, at least in part, by human reliance on images as a way to think and communicate. Indeed, visual perception plays a major role in the human process of apprehending the world and making sense of it. Neisser (1967) proposes that the cognitive process begins with icons, or mental images of stimuli stored for further processing. Research on working memory advances the concept of visuo-spatial sketchpads where the information is stored as mental images (Baddeley, 1986). Moreover, "An image has the advantage of an immediate, global and integrated package of information that cannot be constructed as rapidly by touch, or by written or spoken descriptions." (Mathewson, 1999, p. 35)

It is not surprising then, that educational environments increasingly rely on visual media to improve learning. A 1997 survey of the use of television and video in North American schools reveals a strong acceptance of multimedia in the classroom. Ninety-two percent of the teachers interviewed considered that television and video helped them to be more effective teachers, and 88 percent responded that the technology enabled them to be more creative. In addition, almost 80 percent observed highly positive student outcomes as a result of their classroom use of video technology (Corporation for Public Broadcasting, 1997). Across the globe, even in countries where electronics are not prominent industries, television and video are quickly becoming household items and important tools for learning.

The Impact of Video Technology

Clovis (1997) describes her use of video to **help foreign-born children learn English** in an elementary school in the United States. Equipped with a regular television and video recorder set, Clovis obtained educational programs produced by the public broadcasting network. Before showing the program to her class, she assigned specific tasks to the children. For instance, the students should raise their hands when seeing primary colors in a program about color, or hearing specific sounds in a program about acoustics. At that moment, the tape was paused and the class participated in activities related to the topic. The students watched video segments with and without the sound -- to improve their hearing and speech skills, and would write about the segment -- to practice their verbal and written skills. The use of close-caption enabled the children to see the words being heard, associating visual and auditory stimuli as a tool to expand vocabulary. At the same time, the students were acquiring basic scientific concepts. The children's enthusiasm led some parents to use the videotapes at home to learn English. In addition, students developed their own lessons based on the videos, and volunteered as peer tutors for younger non-English speaking children. Clovis observed that, after introducing the videos in her classroom, the students increased their English proficiency in shorter periods of time.

Video technology also helps **bridge the gap between the school's artificial environment and the outside world**, bringing "reality" into the classroom. An example is the pioneer program developed by Jones & Taff (1986) to train vocational education students in banking operations. The instructors could not place the students as clerk interns because the banks required actual work experience for the

position. To overcome this obstacle, the instructors added a camera to their video equipment and filmed an actual clerk working at a local bank so that students could analyze the tasks involved, the potential problems during a day's work and ways to solve the problems. Next, the instructors videotaped the students role-playing common bank-related tasks, such as the opening of new accounts. The performance was then analyzed by the group with suggestions for improvement. According to the authors, after the videos were incorporated into the lessons, the program placement rates increased from 70 to 93 percent over a two-year period (Jones and Taff, 1986).

In the teaching of science and mathematics, videos can **strengthen the connection between the abstract concepts and principles learned in class and their concrete application** in everyday life, as recommended by the National Research Council (1996). To help students "visualize" concepts such as time and acceleration, Escalada & Zollman (1997) used an Inter Digital Video (IDV) technique (combining video with computers), that enabled the students to work with kinematics graphs. In this experiment, even students with limited background in mathematics, science and technology showed higher motivation and a better understanding of the concepts taught in class than the students who did not work with the IDV programs.

By turning the information into images that can be replayed whenever necessary, the technology **gives the learner more control over the information and empowers the student to set his or her own pace in the learning process**. This flexibility has been used with positive results in teacher training and development programs (Hatfield & Bitter, 1994; Mousley & Sullivan, 1996; Lambdin, Duffy & Moore, 1997). These programs use video clips to provide prospective teachers with exemplary models of instructional methods, classroom management, innovative techniques, or concept and symbol developments. The videos include clips of actual instructors at work, interviews with students and instructors about their classroom experiences, analyses of the styles and techniques presented and their rationale, and any other information that helps the trainees to develop an analytical approach to the teaching process. The technique exposes the trainees to a variety of model teaching experiences to which they can return whenever necessary. The videotaped lessons also help them become familiar with the classroom experience in a controlled, anxiety-free situation, before they start the field placement. The trainees may also be videotaped during their field experience and the tape is analyzed with the supervisor. Reviewing the tapes, the trainees can compare the exemplary models with their own teaching to better understand their weaknesses and strengths and make necessary improvements.

Another advantage of video technology is its **outreach power**. Maheshwari & Raina (1998) employed an Interactive Television system (ITV) to provide training for primary school teachers as part of a governmental initiative to expand elementary education to all children in India. The project is a joint effort between the Indira Gandhi Open University and the Indian Space Research Organisation. It combine two-way video and audio interaction broadcasted via satellite, prerecorded videotape instruction and face-to-face interaction with facilitators at the remote sites. Through the technology, a larger number of teachers, including those located in remote areas, were able to receive instruction directly from the experts. This direct line of communication avoided the loss of information that commonly occurs in the alternative option considered for the project - the cascade model (whereby, training flows down through levels of less experienced trainers until it reaches the target group; in the process, complex information tends to be lost).

> **The capability of using technology does not ensure that its use will be appropriate and that learning will occur.**

Barshinger and Ray (1998) suggest the use of video technology to **help teachers prepare students for field trips**. In this experiment, students were exposed to a museum collection through a two-way audio-visual videoconferencing before a field trip to the museum. By using an ITV technique, students were able to "walk" through the collection and ask questions to the curators while in their classrooms. The students were then provided with focused tasks for their field trip. According to the authors, the preparatory lesson decreased the excitement that tends to disrupt many field trips, and enabled the students to concentrate on their tasks more effectively, making a better use of their learning experience.

The capability of using **technology does not ensure that its use will be appropriate and that learning will occur**. Indeed, its use presents extra challenges for the instructor, who needs to be aware of the potentialities and limitations of the equipment. For instance, Lambdin et al. (1997) describe an experiment in a teaching preparation program where the videos of actual classroom experiences were loaded as the main instructional device during four to five weeks. The final evaluation observed a decline over time in the students' interest and ability to learn from the videos. The authors suggest that the videos should have been interspersed throughout the course for better results.

Issues in the Use of Video Technology

The use of video, as with any new technology or method, does not come easily to its users. Polin (1992) suggests four stages in the adoption and integration of multimedia technology into the classroom:

- The *comfort zone*, when the instructor gets acquainted with the equipment and its operation.
- The *disjointed instructional use*, when the instructor is able to work with the technology, but is still unable to integrate it with his or her instructional goals.
- The *integrated instructional use*, when the teacher is able to integrate the technology into the instructional plans, but the technology still drives the plan.
- The *transparent integration*, when the focus moves from the technology to the content and instructional strategies. At this stage, the technology is no more than one of the many tools used by the teacher to accomplish the educational goals.

To move beyond the "comfort zone," educators must gain some familiarity with the equipment. **Equipment failures are an ongoing problem** reported by instructors and students alike, particularly in the initial stages. The more complex the equipment, such as those used in ITV and IDV systems, the higher the probability of failures). Continuous technical problems will seriously hamper the flow of information, and reduce students' enthusiasm and motivation. An instructor with good working knowledge of the technology may be able to deal with most of these problems, but the ideal arrangement would include a technician to deal with the more serious failures (McHenry & Bozik, 1997).

> The introduction of video into the classroom increases the variables that must be considered in planning the instructional process.

A common challenge to the use of **video technology, particularly ITV, is that it requires more time and coordination than a traditional lecture.** The instructor needs time to become familiar with the equipment. Time is also needed for planning and videotaping the lesson to achieve a quality product. If hand-outs are to be distributed, they must reach the remote sites before class time, and the instructor must take into account the accessibility of reading material to be recommended, since the remote site students may not have access to libraries. Moreover, the instructor must remember that the remote site students will not have the opportunity to ask questions beyond the time allotted for class and need to ensure that enough question and answer time is left within the allotted time. The students will also need time to overcome the initial fear of a new and still uncommon learning environment (Maheshwari & Raina, 1998).

From Here to Where?

Although the literature on the educational use of video technology is growing, the work is still mostly descriptive and **the impact of video in the learning process is not conclusive**. McNeil & Nelson (1991) conducted a meta-analysis of sixty-three studies in ITV and concluded that the technology is an effective instructional method. Research also shows that students accept well the use of video technology in the classroom. Even those who are not familiar with electronic equipment show high motivation to learn, and the final academic achievement, if not better, is not worse than that of students in traditional classes. In the process, students become familiar with the technology used, certainly a secondary gain that must be counted when the programs are evaluated.

The methods used to evaluate technology-based classes require further analysis. Comparing students who had access to IDV with those without IDV access, Escalada & Zollman (1997) found that the IDV users had better understanding of the physics concepts taught, but the final exam scores of the two groups were not significantly different. The authors suggest that this finding reflect an inadequacy in the me66thod chosen to evaluate achievement rather than a program failure. The method chosen, multiple-choice tests focus on achievement, while the IDV program emphasized exploration rather than result. In addition, the short time that was provided to the students to complete the activities might have reduced the potential for learning.

The introduction of video into the classroom increases the variables that must be considered in planning the instructional process. One of these variables is the amount of control the learner has over content and learning strategy. Most research in this area has focused on IDV programs. The programs developed for IDV are either designer-controlled or learner-controlled. In the designer-controlled model, the program sets the ways of sequencing and presenting the information, while in the learner-controlled model, the learner decides which route to take and when to stop the information flow. An alternative, sometimes called mixed control, is to have instructors coaching students on the most effective strategy to break the segments. Research on which model is more conducive to student achievement is inconclusive and **findings vary with the types of learners and the combination between loci of control and other instructional strategies** (Hannafin, 1984; Tovar & Coldevin, 1992; Verhagen & Breman, 1995). An experiment

in the Netherlands found that students tend to cut the segments into lengths similar to the programmed segments, but they scored more poorly than the students who used the designer-controlled model. Researchers suggest that the need to control their learning process may have been an extra buden for the students (Rusman, de Vin, Willemse, Verhagen & Wieggers, 1997).

Although not new, the use of video technology in education is still at an exploratory stage. Its potential has not been fully tapped even in industrialized countries, where the high tech industry plays a dominant role in the economy. Videos can be powerful tools to reduce class size cost-effectively, expand school and college outreach, and respond to the specific needs of different learners. For developing countries, the use of video is particularly cost effective to bring education to remote populations and familiarize them with a technology that has become essential for economic growth. However, educators need to learn more about the potential of video technology before it can be used at its fullest.

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