ABSTRACT
                This paper provides an overview of the numerous
technological tools available to distance education teachers. It is
becoming common to incorporate a variety of tools for design and
implementation of distance learning programs. The distance learning
environment is significantly different from that of a traditional
classroom, and therefore requires considerable reflection on the part
of the teacher. Since the inception of distance learning in the form
of correspondence courses, print tools have been the medium of
choice, including textbooks, study guides, workbooks, course syllabi,
and case studies. Print tools continue to play a significant role in
distance education despite the availability of numerous "high-tech"
alternatives. Discussion also examines video tools, computer tools,
and new interactive technologies, and their roles in distance
education. New concepts in curriculum development and teacher
education will improve the effectiveness of distance learning, and
will lead to innovative approaches to the effective teaching of
diverse student groups who will participate in distance learning.
(Contains 15 references.) (Author/SWC)

Distance Learning:
Technologies, Curriculum Development
and Teacher Education

This paper provides an overview of the numerous technological tools available to distance education teachers. It is becoming common in incorporate a variety of tools for design and implementation of distance learning programs. The distance learning environment is significantly different from that of a traditional classroom and therefore requires considerable reflection on the part of the teacher (Wolcott, 1995). Aspects of curriculum development and teacher education under such unusual circumstances are discussed.
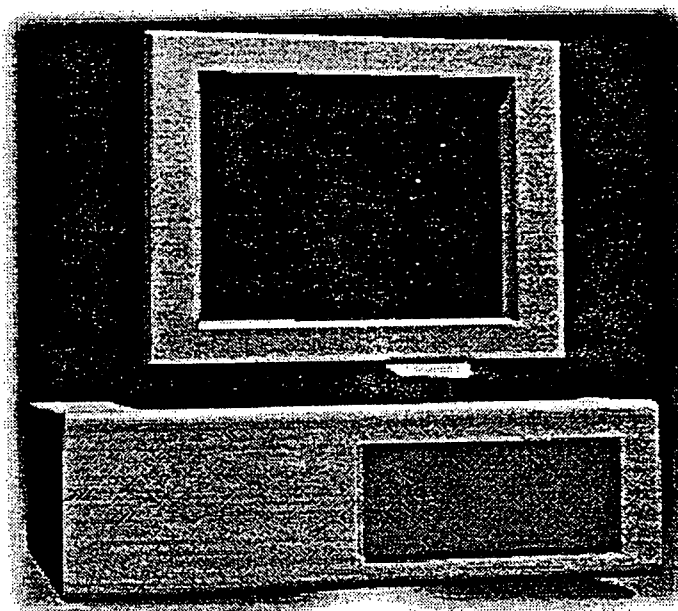
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Introduction

Distance education is a broad category of education that strives to overcome the problem of teacher and learner being separated by some physical distance. Moore and Thompson (1990) state that distance education also involves focusing on the special nature of course design, learning, and instruction under such circumstances. The distance learning environment is important to study and understand since in the future it is not difficult to imagine that its presence might contain a significant portion of the educational community, considering the infusion of recent communications technologies. Along with the obvious advances in communication technology, one can attribute the increased interest in distance education to an emphasis in cost savings and changing demographics (Thach & Murphy, 1995). The distance learning classroom in many ways can be compared to the traditional classroom and considered similar, but there appear to be significant differences that warrant considerable reflection on the part of the teacher (Wolcott, 1995).

Examples

Given current expectations for encouraging lifelong, continuous learning, it seems logical to consider approaches toward the design of distance learning instruction which will engage learners as active participants in the generation of learning (Wagner & McCombs, 1995). I have tried to follow this philosophy while creating software for a liberal arts mathematics course delivered via distance learning. Figure 1 displays a screen capture of an interactive game that was used to promote student interaction. I also created some interactive problem solving situations to promote the generation of mathematical knowledge as well as student interaction. One example is displayed in Figure 2.
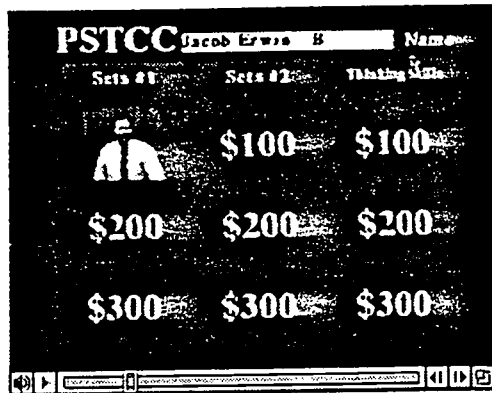
Figure 1
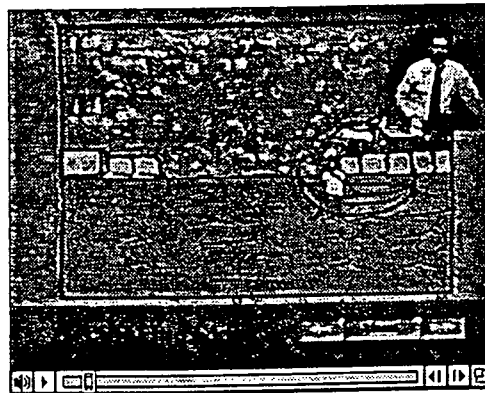
Figure 2

The Technologies of Distance Education

Print Tools for Distance Education

Print has primarily been the medium of choice since the introduction of distance education in the form of correspondence courses. Distance educators have used print in a variety of formats that include: textbooks, study guides, workbooks, course syllabi, and case studies. Why does print still play such a significant role in distance education given the "high tech" alternatives available today? Misanchuk (1994) offers some advantages for the use of print materials that might help answer this question.

- It is familiar to, reasonably well understood by, and accepted by learners.
- It is completely learner paced, i.e., "open."
- It can be navigated relatively easily.
- The technology is familiar to and reasonably well understood by instructional designers and subject-matter experts.
- No special facilities or equipment are needed; it is generally highly portable.
- It has a low unit cost (relative to the alternatives).
- It is a very efficient format for delivering large quantities of content.
- It is easy to revise, given word processing and desktop publishing.

Today's students, however, might not know how to make optimal use of print materials since their senses have been bombarded with multimedia-based information since early childhood. The use of print also severely inhibits interaction, is unable to display motion, and is expensive if color is necessary.

Video Tools

The introduction of a video component into a distance education program can be very effective since visual symbols can provide a connection between thought and experience. Instructional applications of video in distance education have been categorized by Oliver (1994) to include pre-produced video, televised instruction, interactive video, and videoconferencing.

The Cognition & Technology Group at Vanderbilt chose to use video in their situated learning based materials of the Jasper Series for several reasons (Cognition & Technology Group at Vanderbilt, 1992). They felt that it would be easier to make the information more motivating because characters, settings, and actions could be much more interesting. Another reason that they chose video was that the problems to be communicated could be much more complex and interconnected than they would have been using only written text. They felt that this was very important especially for those students that had difficulty with reading. Oliver (1994) also introduces some of the following advantages for the use of video in distance education.

- It provides visual access to a world outside the classroom.
- It is capable of simplifying complex, abstract concepts through visualization.
- It is familiar and "user friendly."
- Drama and documentary can stimulate thought and emotions.
- Simulations and role playing can demonstrate and model behavior.
- It can collapse time and space, capturing and relaying events as they happen.

Today's students, however, are conditioned by commercial television to be passive receivers of video information. Video materials for distance education are expensive and time consuming to produce, as well as costly to revise and update.

Computer Tools

Many industrialized countries introduced computers into classrooms on a large scale in the early 1980s. In the United States, both computer literacy and integration across the curriculum were emphasized from the very beginning. Unfortunately, however, much of the early software was an extension of programmed instruction and drill and practice types of activities. Even though the availability of computers was rapidly increasing, many teachers ignored the new technology

resulting in a very slow integration of microcomputers into classroom instruction. The computer has sometimes been viewed as a tool that takes some control away from teachers and turns it over to the students thereby lending itself nicely to distance education. The rapid growth in computer technology (communications and networking) along with the simultaneous rapid decrease in cost make computers an obvious component of distance education programs now and in the future. Some of the advantages of incorporating computers into distance education are as follows.

- They allow for examination of real world complex problems.
- They are capable of simulating experiences that could not otherwise be observed.
- Microworlds can facilitate exploration and discovery.
- Computers can be used to raise the level of thinking of students by overcoming the mundane calculations previously required to solve problems.
- Networking capabilities can put students in touch with worldwide databases and each other.

There still seems to be some anxiety involved, at least on the part of the teachers, in implementing the use of computers in instruction. Also, it is virtually impossible for a school to keep current computer technology in the schools.

Contemporary and Emerging Interactive Technologies

With the advent of new interactive technologies, educators are challenged to think of powerful, non-conventional ways to construct learning environments (Schwier, 1994). Large storage devices like computer hard drives, videodiscs, and CD-ROMs have made it practical to digitize computer graphic images, animation, video, and sound for random access retrieval. It is this random access to data that makes the learning environment interactive and nonlinear as opposed to video tape that is an example of linear media. Some of the advantages of interactive media as discussed by Schwier (1994) are listed below.

- They allow for different paths, individual learner needs and preferences.
- Strengths of several media can be combined into interactive multimedia systems.
- Students are actively engaged, resulting in increased cognitive investment in the content to be learned.
- Interactive media can be designed to provide immediate and relevant feedback to learners.
- They are cost effective to reproduce and convenient to distribute.

Interactive media can only simulate human interaction and does not have the power or flexibility to adapt to undefined or unexpected needs of students. Initially, interactive media are more expensive than other formats to design and produce.

Curriculum Development

Distance education is increasingly being delivered using combinations of the various tools previously mentioned. This forces an approach to teaching that requires breaking it into constituent parts (Moore & Thompson, 1990). Moore and Thompson state that, "some or all of these are prepared away from the learner, and communicated to the learner through the communications technology, with the possibility of interaction between the learner and an instructor also being through communications technology."

Designing distance education courses involves organizing and controlling the input of many specialists including subject authors, instructional technologists, graphic designers, video and other media specialists (Moore & Thompson, 1990). Moore and Thompson caution against the use of technology for technology's sake. They insist that decisions be based on instructional needs and goals, professional and technical expertise, and according to the available budget.

When determining course design, distance educators must be aware of the most recent technologies. For example, electronic mail, computer conferencing, and most recently computer videoconferencing can greatly enhance student interaction and participation.

While content and mode of delivery are key issues in the development of distance education curriculum, it is important that the materials help promote learner centered instruction. Given current expectations for encouraging lifelong, continuous learning, it seems logical to consider approaches toward the design of distance learning instruction which will engage learners as active participants in the generation of learning (Wagner & McCombs, 1995).

Moore and Thompson (1990) believe that certain principles of instructional design must be incorporated into the curriculum design process in order to obtain a successful teaching/learning experience. Some aspects of teaching that are taken for granted in face-to-face interactions are crucial in distance education. Moore and Thompson (1990) describe four "teletechniques" introduced by Parker and Monson (1980). The first is humanizing, which refers to creating an accepting environment that fosters feelings of rapport between teacher and students to help break down the obstacle of distance. The second is participation, which deals with the amount of interaction among participants in the teleconferencing classroom. Parker and Monson refer to the third teletechnique as message style. Message style involves the strategies that a teacher can use to generate interest and appeal in a presentation or discussion. Finally, they refer to the fourth teletechnique as feedback. Verbal and written feedback allow the teacher to determine the level of effectiveness of the distance teaching/learning process.

Teacher Education

Research and teacher education are essential to the development of effective distance education programs. Moore and Thompson (1990) offer the following three features most influential in requiring such research and training.

1. Distance education uses technologies that are unfamiliar as the primary media of communication for teaching to most teachers and administrators.
2. Distance education requires teachers to specialize in the various functions of teaching, especially those of: counselor, content expert, facilitator of interaction, course designer, and learner.
3. Distance education requires planning, development, production and distribution on a larger scale than is familiar to most teachers and administrators, and requires major intervention by policy makers at national and state levels.

There is a growing realization that traditional techniques of teaching are not as effective in the distance education environment. The need for distance teacher education is one which is echoed more and more in recent literature, especially as communication technologies become more sophisticated (Thach & Murphy, 1995).

Schön (1983) suggests that in reflection, teachers try to make sense out of uncertain and unstable situations. To analyze what goes on in a distance classroom, the teacher should reflect on the context, the learners, and the methods and procedures they employ (Wolcott, 1995). Reflective distance teachers can overcome some of the difficulties that arise in distance instruction by placing themselves in the situation of the distance learner. The distance learning environment is very

unique and requires considerable reflection. A distance teacher cannot expect the same pedagogical principles that were successful in a traditional classroom to be successful without adjustment in the distance learning environment.

Reflecting on my experience as a distance education teacher, it seemed that the technology lended itself to a rigid "school math" interaction pattern as described by Richards (1991). Richards refers to "school math" as the situation where students do not communicate directly with one another, and in fact never address one another. The teacher in "school math" remains in control and speaks every other turn.

Distance education teachers have to acknowledge the changed environment and its contextual influences (Wolcott, 1995). Distance education teachers must also be aware of the capabilities of the medium and work within them while adapting their instructional approaches to reflect the limitations of the medium. Wolcott (1995) offers the following suggestions for ways that distance teachers might acquire a feel for the context and experience of the distance learning environment.

- Talking with distance teachers and reading about others' experiences.
- Observing distance education classes, particularly from the students' point of view.
- Learning about the capabilities and limitations of the equipment and practicing with it.
- Talking with administrative staff, technical personnel, and site facilitators to become familiar with the routines and procedures.
- Talking with distant students to identify their needs and concerns.

Distance education teachers must be aware of the psychological, social, and technical obstacles that distant learners face. Distant students must take more responsibility for their own learning than in a traditional setting. The distant students must also overcome the intimidation of using the technology to interact with the class on a voluntary basis.

Thach and Murphy (1995) saw the need for teacher development in distance education, and believed that a list of competencies should be established that could be used to prepare teachers for the distance learning environment. They felt that the identification of specific competencies within the distance education field should be the initial step in creating an effective professional development program. The literature to this point had been based on the opinions of experts in the field. Thach and Murphy (1995) conducted a study of 100 distance educators and identified the top ten competencies. These competencies illustrated the dual importance of communication skills and technical skills as follows:

(1) Interpersonal Communication,
(2) Planning Skills,
(3) Collaboration/Teamwork,
(4) English Proficiency,
(5) Writing Skills,
(6) Organizational Skills,
(7) Feedback Skills,
(8) Knowledge of Distance Education Field,
(9) Basic Technology Knowledge, and
(10) Technology Access Knowledge.

It is interesting to point out that Catchpole (1992) realized that there are no professional journals on faculty development for distance education teachers.

Conclusions

Within the distance learning environment that includes cameras, microphones, and computers, communication is made possible between teachers and students where it once was not, but at the same time this technology also has the potential to inhibit classroom interactions. However, reflective distance teachers can overcome some of these difficulties by placing themselves in the situation of the distance learner. The distance learning environment is very unique and requires considerable reflection. A distance teacher can't expect the same pedagogical principles that were successful in a traditional classroom to be successful without adjustment in the distance learning environment. Also, and unfortunately, distant students must take more responsibility for their own learning in the distance environment setting than in the traditional setting.

Distance education can be delivered using various media and technological tools. It is becoming more common to use a variety of tools for design and implementation of distance learning programs. Professionals in the field of distance education cannot ignore how the rapid changes in technology can be used to their advantage. Research will be constantly needed and updated in each of the new and evolving forms of distance education delivery.

Distance learning technology does not lend itself well to changing methodology once a class session has begun. So, there appears to be even a greater need for distance teachers to stay with the "prepared script" and thus encourage traditional instruction.

In the future, there will be an increase in the volume of students that enroll in distance learning programs as well as the type of delivery systems that will be used. However, distance education is not, and will not be, for all teachers and students.

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