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ABSTRACT

Evolving from a television library begun in 1962, the Agency for Instructional Technology (AIT) was established by American and Canadian educators in 1973 to strengthen education through technology, and in cooperation with state and provincial agencies, it develops and distributes instructional video and computer materials. It has been active in developing instructional technology that teaches intellectual skills, cognitive strategies, the affective domain, or motor skills in addition to presenting information. In its 1985 instructional video production "Math Works," students are taught to use cognitive strategies, such as critical thinking, to manage their own learning processes by watching peers cope successfully with a difficult math problem. AIT's 2-year program "Principles of Technology" uses 6 different learning situations to teach applied physics to vocational and technical students. It contains 1,500 pages of text, 72 video programs, 90 laboratory sessions, mathematics exercises, classroom presentations, and teacher/student interaction. All materials produced by the agency are evaluated by teachers and other subject matter experts. AIT funds curriculum design and program production by forming consortia of interested state and provincial educational agencies in the United States and Canada. AIT is also actively seeking mutually beneficial curricula-sharing projects around the world and has worked with geographers and television crews in 14 countries to produce a program entitled "Global Geography." Materials intended for use outside the United States are translated, correlated to foreign texts, and adapted to the culture in which they will be used; the videotapes on which the materials are recorded are subjected to various technical conversions. "Principles of Technology" is being adapted for use in Bophuphatswana, Mexico, and Turkey, and "Math Works" is currently being adapted for use in Israel. (A two-page description of "Principles of Technology" is appended.) (MN)

Agency for Instructional Technology

Programming for Today's Learner

THE TRANSFER OF NORTH AMERICAN INSTRUCTIONAL TECHNOLOGY TO DEVELOPING NATIONS

A Focus on Instructional Video

Presentation at the Annual Meeting of the Association for Educational Communications and Technology, New Orleans, LA
January 14-19, 1988

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Evolving from a television library begun in 1962, the nonprofit Agency for Instructional Technology (AIT) was established by American-Canadian educators in 1973 to strengthen education through technology. In cooperation with state and provincial agencies, AIT develops and distributes instructional video and computer materials.

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The Transfer of North American Instructional Technology to Developing Nations

Introduction

Instructional video is one of the most versatile tools at the teachers' command: it can demonstrate a scientific concept, illustrate a distant geographic feature, or dramatize a conflict of economic interests. Teachers can use video to bring a wide variety of vicarious experiences to students who have been limited by geography, economic status, or cultural isolation. Video programming can charge "cold facts" with feeling and involve the students emotionally with the subject matter.

However, television has not always been successful in North American classrooms. Some educators rejected it, fearing that it would replace teachers and dehumanize education; other saw in it immense capability for teaching and learning. There were even those who looked upon it as a cure for all the ills of education. Gradually, disappointment set in.

Much of the programming of the 1950s and early 1960s was unimaginative and technically inferior. Developed by local agencies that had neither the experience nor the resources to do better, most programs merely recorded what was already going on in the classroom; the viewer saw only a "talking head" or a simple visual aid. Educators themselves provided litte direction, and often the programming dealt with subject matter at the fringes of the curriculum.

American school television spent its first dozen years doing unimportant things badly.

Most producers only tried to present information, not to teach intellectual skills, cognitive strategies, the affective domain, or motor skills. For example, a mathematics program about determining the area of a rectangle simply would inform students that "area equals length times width" and provide examples. The program would only present information, such as the formula. Occasionally, a program would advance to intellectual skills, such as applying the formula. Rarely would it attempt to teach cognitive strategies, such as inferring the formula.

Instructional Design

Now, AIT relies heavily on the science of teaching. Its 1985 production, MATH WORKS, does not simply state "A = L x W"; students witness their peers using the discovery process to infer the formula. By observation, students learn to use intellectual skills, such as problem-solving, to apply known rules to new situations. They learn to use cognitive strategies, such as critical thinking, to manage their own learning processes. They develop positive attitudes towards mathematics by watching peers successfully cope with a difficult problem.

Teachers cannot create such materials by themselves; they lack the time, materials, and expertise. Successful learning materials must have high technical, creative, and instructional quality. They should be integrated with other media so that television viewing complements other classroom activities. They should consist of a series of programs, containing enough learning materials to contribute to the improvement of education. They should have a carefully considered sequence of instruction with each program building on preceeding programs and other parts of the total lesson. Finally, the content of the series of programs should be new enough to facilitate improvement in classroom practice, but not so new as to require disruption of existing curricula (Middleton).

Another notable example is PRINCIPLES OF TECHNOLOGY which uses six different learning situations to teach applied physics to vocational and technical students. It contains 1,500 pages of student text. 72 video programs, 90 laboratory sessions, mathematics exercises, classroom presentations, and teacher/student interaction. When creating PRINCIPLES OF TECHNOLOGY, instructional designers used the traditional AIT method:

define the curricular need and state the purpose of the proposed programs in terms clear to the writers and producers who will work from their designs;

analyze research about the subject matter and about teaching in the curricular area;

describe the intended audience;

analyze potential contributions of broadcast and/or cassette video in the teaching/learning process; and

suggest format and design of the materials.

Formative Evaluation

An instructional design is verified through evaluation by teachers and other subject matter experts; subsequent program production is based on that design. The programs then go through formative evaluation with preliminary drafts of scripts, programs, and teacher guides being tested and then modified as the research suggests. The formative evaluation focuses on four criteria: student attention to the program, student comprehension of program content, the nature of classroom interaction stimulated by the program, and the appeal of the program to students and teachers (Middleton).

The process encourages the creation of highly sophisticated programs. The aforementioned MATH WORKS program contains a dramatic vignette about two children coping with a mathematical modeling problem. One of them has a rigid, literal perspective and cannot comprehend abstractions; the other gradually offers enlightenment with the recurring use of one simple word: "pretend." The program also presents the same information about a mathematical formula in three different situations: live action drama, a studio based teacher, and animation. Thus, students are exposed to repetitive messages from different points of view, each presented in highly motivating situations.

Teacher Planning

In "Secondary School Video: A Facilitator's Guide" education researcher Bill Taylor points out that "teacher planning begins with materials rather than objectives, learner analysis, or other "front-end" steps our models prescribe. Teachers plan _from_ materials, not _to_ materials as our theories have held." He lists five essential questions that teachers ask when selecting instructional materials:

> Are these materials within my curricular area? Will these materials be available when I want to use them? Is the preparation time reasonable? Are these materials compatible with my classroom management style? Will these materials help me engage the interests and energies of my students?"

Finally, Taylor quotes a teacher on the importance of immediate access:

> "Availability means nothing; accessibility is everything! Films are available in the county library -- so what? You have to order weeks in advance, and there's no guarantee that you'll get them when you need them. For teachers to use media properly and effectively, it must be accessible to them in the building -- at arm's length."

A teacher can create a lesson that draws on resources far removed from the classroom; for example, video sequences from GLOBAL GEOGRAPHY about deforestation in Nepal and the resulting soil erosion and population shifts. The teacher can show experts and their learning materials and yet remain entirely in control of interaction with the students and the way the program is shaped into a learning experience. By doing so, the teacher will not necessarily find that teaching is easier, but that more students are engaged in learning more of the time, that those who miss the impact of one medium may be affected by another.

Final responsibility for and control of technology in the classroom rests with the teacher. Instructional video programs are designed to make this job as easy as possible: a typical teacher's guide contains a summary of each program; a statement of objectives or goals; suggestions for preparatory activities; follow up activities; a glossary of vocabulary; and lists of useful equipment, readings, and other resources. MATH WORKS and GLOBAL GEOGRAPHY contain charts bound into the teachers' guides that correlate the videos with units in commonly used math and social studies textbooks.

Delivery of Instructional Video Programs

There are a variety of delivery systems available: broadcast television, microwave, satellite, cable, fiber optics, and videocassette. Each has its own features and all can be used successfully to deliver programs to the classroom. Broadcast television, the original delivery system, is still a powerful force because of its ability to beam programs to a large geographic area. Its disadvantage is that it locks the class into a set broadcast time.

Increasing, the videocassette is becoming the medium of choice because teachers have complete control over scheduling the programs. A videocassette player in the classroom permits the most accessibility, flexibility, and freedom for the teacher and class and allows the teacher to interrupt the program to answer questions and lead discussions. Another advantage of videocassettes is that it is far less expensive to supply thousands of classrooms with VCRs, monitors, and entire libraries of programs than it is to construct even one television station.

The AIT Cooperative Development Process

AIT funds curriculum design and program production by forming a consortium of interested state and provincial educational agencies in the U.S. and Canada. When a consortium funds a project (in the case of PRINCIPLES OF TECHNOLOGY, 47 agencies supplied over three million dollars), it is not just financing production, it is uniting as many as 60 educational agencies in the design and evaluation of curriculum materials. Subsequently, the schools within these member agencies have unlimited rights to use the materials for the life of the programs, up to 12 years.

These programs have been successful because the cooperating agencies have committed their time and energy, as well as their financial resources, to make sure the materials are designed and produced to meet their own needs. In addition, the states and provinces have worked to ensure that teachers have access to the programming, are trained to use it, and have the necessary related print resources to facilitate its effective use.

AIT and Global Curriculum Design

AIT is actively seeking mutually beneficial curricula sharing projects around the world. For example, AIT worked with geographers and television crews in 14 countries to produce GLOBAL GEOGRAPHY. Conversely, AIT also assists educators in other countries in importing curricula and related learning materials that were originally developed for U.S. and Canadian schools.

To use AIT's materials outside English-speaking North America, many changes may have to be made: translations, technical conversions of the video tapes, correlation of program content to texts, and cultural adaptations of the programs. The adaptation process relies on the AIT instructional design which was used to create the original materials; it assists in the creation of quality, locally attuned, educational materials. The formative evaluation process is continued during adaptation, insuring that the new programs are suited to their new students.

In some cases, English speaking schools outside the United States and Canada use the programs as they were originally produced. In other cases, the programs are translated, a local host is added to the programs to explain cultural differences, or new printed material is created to assist student understanding of the programs. Occasionally, new video is produced to insure that the programs present local cultural values. In all cases careful attention is paid to the creation of programs that meet local curriculum needs.

There are several examples of this transfer of instructional technology. PRINCIPLES OF TECHNOLOGY is being adapted for use in Bophuphatswana, Mexico, and Turkey. In all three cases the AIT design and evaluation methods are being used to enable producers to create materials that meet the special needs of each country. Just as this transfer of technology can be a shortcut for developing nations, developed nations are also adapting North American materials to save time in the development cycle. For example, by adapting MATH WORKS and IT FIGURES, rather than producing new programs, Israel will be able to introduce its new mathematics curriculum ahead of schedule and under budget.

Additional Information

Portions of this paper are treated in detail in the following AIT publications:

Middleton, John, "Cooperative School Television and Educational Change: The Consortium Development Process of the Agency for Instructional Television", 1979, AIT.

Nelson, John E. "School Television in North America", paper delivered to the IV Jornada Latino-Americano De Educacao; Sao Paulo, Brasil, 1987

Secondary School Video: A Facilitator's Guide. 1981, AIT

Sloan, Kay Robinson, "Thinking Through Television: The First Six years of the Skills Essential to Learning Project", 1980, AIT.

AIT also publishes a quarterly newletter. To receive free copies or obtain additional information, write to:

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PRINCIPLES OF TECHNOLOGY
Background Information
AECT, 1988, New Orleans

John E. Nelson, Manager
International Activities

PRINCIPLES OF TECHNOLOGY is a two-year applied physics curriculum for secondary vocational and technical students. It consists of 1,500 pages of student reading in 14 texts, 72 instructional videos, and 14 teachers' guides complete with laboratory experiments, mathematics skill exercises, and demonstrations.

It was created because only 2% of American vocational students were studying physics! To combat this dismal acceptance of traditional, theoretical physics courses, vocational educators created a new pedagogy that (1) teaches applied, rather than theoretical, physics and (2) unifies, rather than separates, instruction about the energy systems.

In PRINCIPLES OF TECHNOLOGY students spend 40% of their time in "hands-on" learning. They study 14 principles as they relate to four energy systems; for example, the first unit teaches:

force in MECHANICAL systems,
force in FLUID systems,
force in ELECTRICAL systems, and
force in THERMAL systems.

Each of the 14 units deals with one principle as it applies to the four energy systems:

1) Force	6) Power	11) Transducers
2) Work	7) Force Transformers	12) Radiation
3) Rate	8) Momentum	13) Optical Systems
4) Resistance	9) Waves and Vibrations	14) Time Constants
5) Energy	10) Energy Convertors	

PRINCIPLES OF TECHNOLOGY helps students think in terms of systems instead of narrow specializations; enabling them to adapt and retrain more easily than if they had learned only a few skills.

PRINCIPLES OF TECHNOLOGY was developed by AIT, a consortium of 47 state and provincial educational agencies, and the Center for Occupational Research and Development. It is one of 25 video- and computer-based curriculum projects that AIT and American-Canadian educational agencies have developed cooperatively. It relied extensively on formative evaluation and was tested by the consortium in 75 of their schools while it was being produced.

Perhaps PRINCIPLES OF TECHNOLOGY is explained best by a simple illustration about how today's technicians are confronted by the diversity, complexity, and rapid evolution of equipment. Twenty-five years ago AIT had manual typewriters which were repaired by "typewriter mechanics." They were mechanics in the literal sense -- they dealt with physical principles of mechanical systems. Then electric typewriters began to appear and mechanics

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had to learn some of the principles of electrical systems; now AIT has electronic typewriters, word processors, computers, optical readers, and ink-jet and laser printers. Such devices are remarkably efficient but cannot be repaired -- much less designed and constructed -- by a mechanic or an electrician.

PRINCIPLES OF TECHNOLOGY accomplishes more than just teaching the principles of technology. Its other goals include:

assisting students in career flexibility ... by giving them the knowledge necessary to compete as machines and technology advance;

exposing students to the most modern workplace enviromments ... by taking the cameras into technologically advanced facilities;

supplying career role-models ... by using technicians as on-camera talent;

augmenting the available faculty of vocational schools ... by supplying direct instruction from the videotapes;

offering hands-on experience, the best of traditional vocational education ... by including over 90 laboratory exercises;

invigorating student interest ... by using an appealing instructional system of video presentations, demonstrations, texts, and hands-on laboratories;

allowing a diverse mix of students in one classroom ... by containing remedial exercises, advanced lessons, and preparatory mathematics skills labs; and

maintaining the academic rigor needed to meet some of the increased science requirements for secondary school graduation in the United States and Canada.

Turkey's Ministry of Education elected to replicate the North American development process by testing each unit as it was translated and adapted. For that purpose they selected a mixture of 32 Turkish and English speaking vocational and academic high schools. Unfortunately, the written report of the test is not available yet; preliminary verbal reports are favorable.

The translators faced several problems. For example, the average Turkish sentence is longer than the average English sentence, thus pagination and lay-outs of illustrations had to be refigured. The laboratory experiments are based on equipment that is readily available in the U.S. and Canada. Some can be made by vocational teachers; those experiments had to be modified so that Turkish teachers could easily obtain the materials to make the equipment. To insure accuracy, university trained engineers translated the tests and modified the labs.