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The influence of instructional television on learning

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Abstract

This report examines the research of media's influence on learning and, more specifically, reviews the history and research of instructional television. It is hoped that the reader will gain insight into the potential influence of media, and the worth of instructional television for the future. The intent of this review is threefold; 1) to discuss the influence of media on learning, 2) to identify significant trends and/or conclusions which have emerged in ITV since it's inception in the early 1930s; and 3) to allay concerns about the effectiveness of television as a mode of delivering instruction.

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CHAPTER 1

INTRODUCTION

Instructional television has been used in American schools and universities for about 50 years and has become the symbol in the minds of many educators and researchers as the "failed medium," the unproductive experiment, and the case study not to be replicated. In recent years, due to the advent and popularity of the computer, instructional television (ITV) appears to have taken the back seat in perceived impact and importance in academia (Cambre, 1987).

Scholars and practitioners in the educational technology field are now directing their attention not at the medium of television, but rather the instructional methods that users of instructional television employ with students. Their attention is also directed toward the environment in which the instruction takes place, and the cognitive processes it engages through the use of communication techniques.

This report examines the research of media's influence on learning and, more specifically, reviews the history and research of instructional television. It is hoped that the reader will gain insight into the potential influence of media, and the worth of instructional television for the future. The intent of this review is

threefold;

1) to discuss the influence of media on learning,

2) to identify significant trends and/or conclusions which have emerged in ITV since it's inception in the early 1930s; and

3) to allay concerns about the effectiveness of television as a mode of delivering instruction.

Methodology

CD Rom computer searches of the Reader's Guide and the Education Resources Information Center's (ERIC) data bases were conducted at the University of Northern Iowa's Library. The searches uncovered published and unpublished findings dating back to the early 1930s.

All references obtained from the various computer searches were read and evaluated for their relevance to this specific report. Those bearing on the effectiveness of media treatments and instruction offered via television are reported and referenced.

The literature on this subject proved to be so extensive that it was impossible to review every possible study, however, it is believed that the contents of this report represent an accurate reflection of research findings.

Definitions

The ubiquity of commercial and educational (public) television leads most people to assume that they know what instructional television is. This is not in every instance an accurate assumption. Instructional television has traditionally been defined as television designed and produced specifically for elementary and secondary students with the expectation that it would help those students achieve specific learning goals under supervision of educators in a structured learning setting (Winn, 1987). Examples of instructional television in current use include "Think About," "The Inside Story of Slim Goodbody," "Newscasts from the Past," and "All About You." These and other ITV programs are broadcast on Public Broadcasting System (PBS) stations during the school day. Because of the relative inaccessibility if ITV programming to those working outside school or home settings, many critics of ITV, including researchers, have had very limited exposure to these types of programs.

The more familiar type of programming is "educational television," now called "public television," which has the broader mission of conveying information and culture to audiences of all ages. Many of these programs are now used in schools or assigned for home viewing, and are

broadcast on PBS stations from approximately 4 pm through prime time. Examples of these programs include "Nova," "Shakespeare," and "National Geographic." Also in this category are the Children's Television Workshop's series, most notably today "Sesame Street," "3-2-1 Contact!", and the new mathematics series, "Square One." Several of these series are available in ITV schedules as well as after-school PBS lineups (Winn, 1987).

Yet another use of television in schools is as an object of study, with a specified curriculum sometimes called "critical viewing skills." Commercial television programs usually provide the content, which is studied for production and persuasion techniques.

Television, or more appropriately video, is also used in schools as a communication device. Classroom and school productions allow students to gain hands-on experience on both sides of the camera.

In addition, there is extensive use of television in "telecourses," which are usually meant for the off-campus adult learner and which often offer college credit.

Conventional or traditional instruction, as will be alluded to in this report, refers to face-to-face instruction in a traditional classroom setting.

"Distance learning" generally has a television component, and usually refers to the transmission of a

televised class from one point to another, sometimes with two-way interaction.

Any two or more of these uses of television/video in formal education settings may overlap, and at one time or another all have been included under the rubic "instructional television." This confusion of terms makes it very difficult to interpret what a writer really means when the term "instructional television" is used in connection with schooling, or when a researcher declares that ITV is "dead."

The confusion is exacerbated by the multitude of delivery systems available for the dissemination of the television picture. The most common transmission of the ITV signal is by satellite to PBS stations, or to local cable companies of ITFS (Instructional Television Fixed Services) systems. Some school systems and regional media centers have invested in satellite dishes to receive the ITV signal directly through Direct Broadcast Satellite (DBS). Few expect that signal to be used live in the classroom, on the contrary, videotape has become the medium of choice for using the ITV programming. Tapes may be recorded from the satellite signal or from intermediate distribution signals, or they may be purchased directly from distributors.

There is recent movement from within the ITV community away from the use of the words "instructional television." The ITV Futures Planning Group chooses to describe its domain as "Learning Technologies." The Agency for Instructional Television (AIT), the oldest and largest producer/distributor of ITV materials, recently changed its name to the Agency for Instructional Technologies. In its recent publications, AIT prefers to speak of "video technology" when describing instructional television. The new names represent a shift in emphasis precipitated primarily by the infusion of the videotape recorder, the computer, and the videodisc, into the schools. A serendipitous side effect is the shedding of negative associations with commercial television and with the image of ITV as a failed medium (Winn, 1987).

CHAPTER 2

REVIEW OF LITERATURE

Research On Learning From Media

Studies of the influence of media on learning have been a feature of educational research since Thorndike (1912) recommended pictures as a labor-saving device in instruction. Most of this research is reinforced by the hope that learning will be enhanced with the proper mix of medium, student, subject matter, content, and learning task. A typical study compares the relative achievement of groups who have received similar subject matter from different media. This research has led to so-called "media selection" schemes or models (e.g., Reiser & Gagne, 1982). These models generally promise to incorporate existing research and practice into procedures for selecting the best medium or mix of media to deliver instruction. Most of these models base many of their prescriptions on presumed learning benefits from media (Jamison, Suppes, & Wells, 1974).

Even in the few cases where dramatic changes in achievement or ability have followed the introduction of a medium, as was the case with television in El Salvador (Schramm, 1977), it was not the medium that caused the change but rather a curriculum reform that accompanied the change. The best current evidence is that media are mere

vehicles the deliver instruction but do not influence student achievement. Basically, the choice of vehicle might influence the cost or extent of distributing instruction, but only the content of the vehicle can influence achievement. While research often shows a slight learning advantage for newer media over more conventional instructional vehicles, this advantage will be shown to be vulnerable to compelling rival hypotheses. Among these rival explanations is evidence of artifact and confounding in existing studies and biased editorial decisions which may favor research showing larger effect sizes for newer media.

In the 1960's, Lumsdaine (1963) and others (e.g., Mielke, 1968) argued that gross media comparison and selection studies might not pay off. They implied that media, when viewed as collections of mechanical instruments, such as television and computers, were sample delivery devices. Nevertheless, earlier reviewers also held the door open to learning effects from media by attributing much of the lack of significance in prior research to poor design and lack of adequate models or theory.

Lumsdaine (1963) dealt primarily with adequate studies that had used defensible methodology, and had found significant differences between treatments. With

the benefit of hindsight it is not surprising that most of the studies he selected for review employed media as simple vehicles for instructional methods, such as text organization, size of step in programming, cuing, repeated exposures, and prompting. These studies compared the effects of, for example, different step size in programmed instruction via television. It was step size (and other methods), not television (or other media), which were the focus of these studies. This is an example of what Salomon and Clark (1977) called research *with* media. In these studies media are mere conveyances for the treatments being examined and are not the focus of the study, though the results are often mistakenly interpreted as suggesting benefits for various media. An example of instructional research with media would be a study which contrasted a logically organized audiotutorial lesson on photosynthesis with a randomly sequenced presentation of the same frames (Clark & Snow, 1975; Salomon & Clark, 1977). Perhaps as a result of this confusion, Lumsdaine (1963) reached few conclusions beyond the suggestion that media might reduce the cost of instruction when many students are served because "the cost of perfecting it can be prorated in terms of a denominator representing thousands of students" (p.670).

A decade later, Glaser and Cooley (1973) and Levie and Dickie (1973) were cautious about media comparison studies, which apparently were still being conducted in large numbers. Glaser and Cooley (1973) recommended using any acceptable medium as "a vehicle for making available to schools what psychologists have learned about learning" (p. 855). Levie and Dikie (1973) noted that most media comparison studies to date have been fruitless and suggested that learning objectives can be obtained through "instruction presented by any of a variety of different media" (p.859). At that time televised education was still a lively topic and studies of computerized instruction were just beginning to appear.

During the past decade, television research seems to have diminished considerably, but computer learning studies are now popular. The current research belongs to the familiar media comparison approach or is concerned with different contents or methods being presented via different media (e.g., science teaching by computers). Generally, each new medium seems to attract its own set of advocates who make claims for improved learning and stimulate research questions which are similar to those asked about the previously popular medium. Most of the radio research approaches suggested in the 1950's (e.g., Hovland, Lumsdaine, & Sheffield, 1949) were very similar

to those employed by the television movement of the 1960's (e.g., Schramm, 1977) and to the more recent reports of the computer-assisted instruction studies of the 1970's and 1980's (e.g., Dixon & Judd, 1977). It seems that similar research questions have resulted in similar and ambiguous data. Media comparison studies, regardless of the media employed, tend to result in "no significant difference" conclusions (Mielke, 1968). These findings were incorrectly offered as evidence that different media were "equally effective" as conventional means in promoting learning. No significant difference results simply suggest that changes in the outcome scores (e.g., learning) did not result in any systematic differences in the treatments compared.

Occasionally a study would find evidence for one or another medium. When this happens, Mielke (1968) has suggested that the active ingredient might be some uncontrolled aspect of the content or instructional strategy rather than the medium. This evidence may be found in the current analyses of media comparison studies.

One of the most interesting trends in the past decade has been a significant increase in the number of excellent reviews and meta-analyses of research comparing the learning advantage of different media. The results of these overviews of past comparisons studies seem to be

reasonably unambiguous and unanimous. Taken together, they provide strong evidence that media comparison studies that find casual connections between media and achievement are confounded.

A recent series of meta-analyses of media comparison studies have been conducted by James Kulik and his colleagues at The University of Michigan (Cohen, Ebling & Kulik, 1981; C. Kulik, Kulik, & Cohen, 1980; J. Kulik, Bangert, & Williams, 1983; J. Kulik, Kulik, & Cohen, 1979). These reviews employ the relatively new technology of meta-analyses (Glass, 1976), which provides more precise estimates of the effect size of various media treatments than were possible a few years ago. Previous reviews dealing primarily with "box score" sums of significant findings for media verses conventional instructional delivery were sometimes misleading. Effect size estimates often were expressed in portions of standard score advantages for one or another type of treatment. This discussion will express effects in one of two ways: a) the number of standard deviations separating experimental and control groups, and b) as improvements in percentile scores on a final examination.

An illustration of the advantage of meta-analytical effect size descriptions of past research over "box scores" is available in a recent review of Postlewait's

audiotutorial instruction studies (J. Kulik, Kulik, & Cohen, 1979). The authors found 42 adequate studies, of which 29 favored audiotutorial instruction and only 13 favored conventional instruction. Of those 42, only 15 reported significant differences, but 11 of the 15 favored audiotutorial and only 4 favored conventional instruction. This type of box score analysis would strongly favor the learning benefits of the audiotutorial approach over more conventional means, whereas effect size estimates of this data show only .2 standard deviations differences in the final exam scores of audiotutorial and conventional treatments. Kulik and his colleagues reported that this difference was equivalent to approximately 1.6 points on a 100-point examination. The small effect is not instructionally significant and could be easily due to confounding.

The most common sources of confounding in media research seem to be the uncontrolled effects of a) instructional method or content differences between treatments that are compared, and b) a novelty effect for newer media, which tends to disappear over a period of time.

In effect size analyses, all adequate studies are surveyed. They involve a great variety of subject matter content, learning task types, and grade levels. The most

common result of this type of survey is a small and positive effect for newer media over more conventional instructional delivery devices. However, when studies are subjected to meta-analysis, our first source of rival hypotheses, medium and method confusion, shows up.

The positive effect for media more or less disappears when the same instructor produces all treatments (C. Kulik, Kulik, & Cohen, 1980). Different teams of instructional designers or teachers probably give different content and instructional methods to the treatments that are compared. If this is the case, we do not know whether to attribute the advantage to the medium or to the differences between content and method and the media being compared. However, if the effect for media tends to disappear when the same instructor or team designs contrasting treatments, we have reason to believe that the lack of difference is due to greater control of nonmedium variables. It was Mielke (1968) who reminded us that when examining the effects of different media, only the media being compared can be different. All other aspects of the treatments, including the subject matter content and method of instruction, must be identical.

There is also evidence in the meta-analyses that it is the method of instruction that leads more directly and powerfully to learning. Glaser (1976) defines

instructional methods as "the conditions which can be implemented to foster the acquisition of competence" (p.1). It seems not to be the media but variables such as instructional methods that foster learning. For example, instructional programs such as the Keller (1968) personalized system of instruction (PSI) and programmed instruction (PI) contain methods which seek to add structure, shorter steps, reduced verbal loads, and self-pacing to lessons. Each, however, is typically associated with a different medium. The PSI approach is usually presented by text, and PI is often the preferred approach of those who design computer-assisted instruction. When studies of PI via text and via computer-assisted instruction are compared for their effect size they are similar. Both seem to show about a .2 standard deviation final examination advantage over conventional instruction (C.Kulik, Kulik, & Cohen, 1980). A compelling hypothesis to explain this similarity might be that most computerized instruction is merely the presentation of PI or PSI via a computer.

When computer and PI effects are compared with the use of visuals in televised or audiotutorial laboratories, the PI and computer studies show about a 30% larger effect size. The largest effect size however, is reserved for the PSI approach. The description of this instructional

program tends to focus on its essential methods rather than on a medium. Perhaps as a result, it typically results in a .5 standard deviation effect size when compared with conventional, computer, PI, or visual instruction (C. Kulik, Kulik, & Cohen, 1980). This would indicate that when we begin to separate method from medium we may begin to explain more significant amounts of learning variance.

A second, though probably less important source of confounding, is the increased effort and attention research tend to give to media that are novel to them. The increased attention paid by students sometimes results in increased effort or persistence, which yields achievements gains. If they are due to a novelty effect, these gains tend to diminish as students become more familiar with the new medium. This was the case in reviews of computer-assisted instruction at the secondary school level (grades 6 to 12) (Kulik, Bangert, & Williams, 1983). An average effect size of .32 (e.g., a rise in exam scores from the 50th to the 63rd percentile) for computer courses tended to dissipate significantly in longer duration studies. In studies lasting 4 weeks or less, computer effects were .56 standard deviation. This reduced to .3 in studies lasting 5 to 8 weeks and further reduced to the familiar .2 effect after 8 weeks of data

collection. Cohen (1977) describes an effect size of .2 as "weak" and notes that it accounts for less than one percent of the variance in a comparison.

Based on this consistent evidence, it seems reasonable to advise strongly against future media comparison research. Five decades of research suggest that there are no learning benefits to be gained from employing different media in instruction, regardless of their obviously attractive features or advertised superiority. All existing surveys of this research indicate that confounding has contributed to the studies attributing learning benefits to one medium over another and that the great majority of these comparison studies clearly indicate no significant differences.

This situation is analogous to the problems encountered in research on teaching. In that area, the teacher was constantly confused with teach*ing*. Improvements in research findings result when specific teaching behaviors compete to influence learning rather than different types of teachers (Rosenshine, 1971). Where learning benefits are at issue, it is the method, aptitude, and task variables of instruction that should be investigated. Studies comparing the relative achievement advantages of one medium over another will inevitably confound medium with method of instruction.

During the 1970s a new type of question emerged, which seemed to eliminate many of the conceptual problems in the media comparison question. Instead of focusing on media per se, it was recommended (Clark, 1975; Levie & Dickie, 1973; Saloman, 1974b) that we study "attributes" of media and their influence on the way information is processed in learning. In this view, many media posses attributes such as the capacity to slow the motion of objects or "zoom" into details of a stimulus field or to "unwrap" a three-dimensional object into its two-dimensional form. These attributes were thought to cultivate cognitive skills when modeled by learners, so that, for example, a child with low cue attending ability might learn the cognitive skill of "zooming" into stimulus details (Salomon, 1974a), or novice chess players might increase their skills in recognizing potential moves and configurations of chess pieces through animated modeling of moves and patterns (Blake, 1977). Because this type of question dealt with the way that information is selected and transformed in the acquisition of generalizable cognitive skills, many believed that the possibility of a coherent theory dealing with media attributes was forthcoming (Olson, 1972; Schramm, 1977). In addition, it was exciting to imagine that these media attributes might result in unique cognitive skills because they promised to

teach mental transformations which had not been experienced previously.

The promise of the media attributes approach is based on at least three expectations: a) that the attributes were an integral part of media and would provide a connection between instructional uses of media and learning; b) that attributes would provide for the cultivation of cognitive skills for learners who needed them; and c) that identified attributes would provide unique independent variables for instructional theories that specified casual relationships between attribute modeling and learning--finally the evidence for a connection between media and learning. While the final point is most important, it appears that the media attribute question has many of the problems that plagued the media comparison issue. Generally, the evidence suggests that only the second expectation has been fulfilled, which implies that media attribute research may contribute to instructional design but not to theory development (Olson, 1972).

The first expectation was that these media attributes would somehow represent the psychologically relevant aspects of media. Few of the originators of the media attribute construct (Olson & Bruner, 1974; Salomon, 1974b) claimed that they were more than "correlated" with

different media. Since they were not exclusive to any specific media and were only associated with them by habit or convenience, they were not "media" variables any more than the specific subject matter content of a book is part of the definition of the "book." In fact, the early discussions of the construct most often referred to "symbol systems" or symbolic "elements" of instruction. All instructional messages were coded in some symbolic representational system, the argument went, and symbols vary in the cognitive transformation they allow us to perform on the information we select from our environment. Some symbolic elements (animated arrows, zooming) permit us to cultivate cognitive skills. However, many different media could present a given attribute so there was no necessary correspondence between attributes and media. Media are mere vehicles for attributes so it is misleading to call them *media* attributes.

The second expectation of the attribute approach was more realistic. While Mielke (1980) is correct that very few of the cultivating attributes have been found and validated. there is positive evidence for Salomon's (1979) claim that "the coding elements of a . . . symbol system can be made to cultivate the mastery of specific mental skills by either activating or overtly supplanting the skills" (p. 216). The problem lies not in the fact that

symbol systems can be made to cultivate skills but in whether these symbolic elements or attributes are exclusive or necessary to learning. If the attributes identified to date are useful in instruction they are valuable. However, theory development depends on the discovery of basic or necessary processes of instruction and learning (Cohen, 1977).

There is recent evidence that the attributes of symbol systems are occasionally sufficient but not necessary contributors to learning. In science, sufficient conditions are those events which were adequate to produce some outcome in a past instance (Blake, 1977). There is no guarantee, however, that sufficient conditions will ever produce the outcome again because the variable that caused the outcome was merely correlated with the condition. Without necessary conditions we run the risk of failing to replicate achievement gains when we change the context, times, or student clients for instruction. Instructional theory seeks generalizations concerning the necessary instructional methods required to foster these cognitive processes (Shuell, 1980).

Historical Background Of Instructional Television

From the creation of the first experimental educational broadcast by the State University of Iowa, Iowa City, on January 25, 1933, to the present,

instructional television has undergone several changes in many areas including content, method of transmission, availability, and reputation. Elementary and secondary schools began using television for instructional purposes in the 1940's and by 1948, at least eight colleges and universities were producing and using ITV (Wood & Wylie, 1977).

In 1953, KUHT, the first educational television station in the nation, was licensed to the University of Houston. Within ten years there were almost a hundred. ITV at that time was presented mainly as a "master teacher," supposedly a replacement for the regular classroom teacher in specified areas of study (Wood & Wylie, 1977).

In 1962, the Congress of the United States dedicated a specified frequency spectrum for instructional purposes. This spectrum area, the Instructional Television Fixed Service, was first used by the Plainridge Public School System on Long Island (Curtis & Blatecky, 1977).

Following the publication of the Carnegie Commission Report in 1967, the federally funded Corporation for Public Broadcasting was created to oversee all of the noncommercial broadcasting. Liberal grant funding from the Ford Foundation is credited with making the network of educational television stations a reality (Purdy, 1983).

Also, with the new availability of videotape, portable equipment and live broadcasts, the emphasis shifted to a "you are there" concept, where the "real world" was brought into the classroom.

Commercial networks also experimented with ITV in the early years. NBC's "Continental Classroom" survived five years and CBS's "Sunrise Semester" aired for 17 years (Naylor, 1984). The teaching environment during these first 20 years tended to "turn off" the majority of university professors. The bright lights, cameras, hanging wires, often no students, and often no feedback caused anxiety and concern to many educators (Martin, 1972). There were numerous successes, however. Chicago's TV college, for example, has been functioning since 1956 as an extension of the City College of Chicago. This success and relevant others reflect the technically polished, curriculum-related programs of the '70s that expanded on what was already being taught.

By the late '70s a "back to the basics" movement saw ITV presenting opportunities for the application of basic skills to life situations. And now, in the '80s, with more programs and series available than ever before, the trend seems to be the presentation of learning materials in highly vivid dramatic and documentary formats, aided by state-of-the-art special effects which it is hoped can

reinforce learning by virtue of strong visual stimuli (Hudspeth & Brey, 1986).

Review Of Literature

There is a large body of literature which reports on reviews of existing research reports in the area of instructional television. The landmark study of this kind was by Chu and Schramm, published in 1967 and cited in numerous other reviews. The authors compiled 207 published studies in which television was compared with conventional teaching. Of 421 separate comparisons made in these studies Chu and Schramm found that 308 showed no significant differences in student achievement. Sixty-seven of the studies showed television instruction to be superior and 50 found conventional instruction better. This study updated a similar study by Schramm in 1962 in which he reviewed 393 experimental comparisons of television verses classroom teaching, including a large number of unpublished studies. He reported that 255 of these comparisons resulted in findings of no significant difference. Eighty-three found significant differences in favor of conventional teaching. In 1975, Chu and Schramm updated their earlier study under contact with the U.S. Department of Health, Education and Welfare.

Questioning the methodology employed in research on televised instruction, D.W. Stickell in his doctoral

dissertation (1963) for the Pennsylvania State University applied rigorous methodological standards to 250 experimental comparisons of televised verses classroom instruction. He found that only 10 met his rigid requirements for adequate experimental design. All studies were conducted at the Pennsylvania State University. Of the ten which met his criteria for acceptable research, Stickell found no significant difference in learning at the commonly accepted levels of statistical significance. Stickell judged 23 other studies to be marginally acceptable. These studies also showed no difference between face-to-face and televised instruction. Chu and Schramm suggest that these studies which did not conform to rigid standards of clean experimentation reflect the results of practical limitations and realistic conditions. They argue that not all bias would occur in the same direction and that the statistical law of random operation would apply (Chu & Schramm, 1975).

Dubin and Hedley in 1969 conducted an analytical review of 381 experimental studies in which classes taught by television were compared to control classes receiving no televised instruction. The authors identified 42 such studies that could be considered comparable on the basis of several criteria including similar methods of

instruction and identical examinations. The studies compared televised instruction with face-to-face teaching by lecture, a combination of lecture/discussion/demonstration, or discussion. It was concluded that one-way instructional television produced the same amount of learning as the compared methods (O'Rourke, 1980).

Other studies cited in reviews of the literature include Kanner, Runyon, and Desiderato (1954) who found that 400 United States Army trainees learned as well or better when taught by television as they did when taught conventionally (O'Rourke, 1980). Chu and Schramm reviewed six experimental studies comparing the achievement of students viewing TV at home with students who viewed TV on campus and/or received conventional instruction. The assumption was that on-campus TV instruction would be more effective because of social support, competition, interaction, and supervision. In each study the at-home group was found to achieve as well or better than the on-campus groups (Chu & Schramm, 1975). Sales (1976) reports that an intensive examination of the results conducted at Chicago's Television College in 1960 indicated that students receiving televised instruction performed as well as students receiving classroom instruction. Kelly's review covering the period of

1956-1961 of performance in matched achievement test comparisons in English, mathematics, science, and social studies indicated that television students performed as well as on-campus students (Chu & Schramm, 1975). Pflieger and Kelly, in a 1961 report, summarized the results of a three-year national program funded by the Ford Foundation in which 200,000 students from 800 public schools were involved. On more than 300 matched achievement tests, 119 of the television-taught students performed significantly better. The remainder showed no significant difference (Chu & Schramm, 1975; Sales, 1976).

In a Canadian study, a lecture was presented to a studio audience, was heard simultaneously via radio, and was seen and heard via TV. A forth group read the lecture. Post-tests of content administered immediately after the lecture and readministered eight months later showed that the mean score of the TV group was significantly better than the radio group which in turn was significantly better than the studio audience or the readers (O'Rourke, 1980).

A standard of comparison can also be derived from standardized test performances. For example in Hagerstown, Maryland television was installed in the Washington County School System. The performance of students were measured by the Iowa tests of achievement.

The Hagerstown students in grade 5 gained 1.9 years, measured against national norms. This shows impressive evidence that effective learning occurred through the use of television. Math scores of students in junior high also rose during the four years of televised instruction, from the 31st to the 84th percentile.

Since Hagerstown has integrated instructional television into it's curriculum, many changes have been noted in student test scores as summarized by Wade (1967):

1. In arithmetic classes taught by television, significant academic gains were made by participating students. For example, 5th-grade students gained an average of 1.9 years in their understanding of basic mathematical concepts injust one school year. These skills were measuredon the Iowa test of basic skills.

2. The 3rd and 4th graders, who averaged half a grade below the national norm before the use of television, all exceeded the norm after one year of television. The 5th and 6th graders exceeded the norm after two years.

3. The students that made significant gains in math, which was taught by television as a regular part of the course, made very small gains in reading, which was offered by television on a voluntary basis and unsystematically.

4. In junior high general mathematics, the average achievement level of students on a standardized test of concepts rose in four years of television instruction from the 31st percentile to the 84th percentile, and on a standardized test of problem-solving from the 33rd percentile to the 68th percentile.

5. In grade 10 mathematics, scores rose from the 34th percentile before television to the 51st.

6. In grade 6 science, television pupils showed more growth than conventionally taught pupils at all ability levels.

7. 8th grade student scores in the general science class, as measured on a standardized test, were two years higher after several years of television, than before television.

8. Small gains were recorded in the core courses of social studies and language.

9. Significant gains were made in U.S. history classes taught by television. The percentile on national norms in 1958 before television was 28 and in 1959 (first year of television), 45; in 1960, 46; in 1961, 50.

10. Consistent, but not significant, were gains recorded in 12th grade English taught by television.

11. Although it is difficult to access achievement in music and art, the Hagerstown students exposed to televised

courses scored higher than pupils who did not have the televised instruction.

In a 1961 study by Janes, 375 college students chose whether to take a class at home via television, to take the same class on campus via television, or to take identical instruction from the same instructor in a traditional setting. 47% of the students chose to take the instruction via television. 11% of those who initially chose face-to-face instruction changed during the course of the semester to the television format. Only two percent of the TV students changed to obtain face-to-face instruction. Students who chose to watch the instruction via television at home reported the highest level of satisfaction among the three groups (Chu & Schramm, 1975).

O'Rourke notes that the British Open University, which has had extensive experience offering televised instruction, reported that of 64,000 students which had been enrolled in television classes up to 1977, 91.4% had been successful in earning college credit for courses taken (O'Rourke, 1980).

Chu and Schramm note the wide variety of instruction which has been offered via television including chemistry, anatomy, public speaking (with on campus presentations), driver education, typewriting, and others. A study by Pasewark in 1957 indicated that television-taught students

learned to type significantly faster and somewhat more accurately than those taught in the traditional mode by the same instructor (Chu & Schramm, 1975).

Enders (1960) compared two groups of sixth-grade children who received science programs on television with a control group that did not watch the programs. The two groups who received the televised instruction scored significantly greater than the control group.

Lottes (1961) randomly assigned 213 primary schoolteachers to two treatment groups. The experimental group watched 15 half-hour programs on reading instruction. The control group was told to write weekly reports on reading instruction. The TV group teachers showed a significant increase in classroom performance, while the control group showed no improvement.

Langdale (1962) conducted an experiment in an interracial neighborhood in New York City. He found closed-circuit television an effective medium for teaching English to Spanish-speaking people, and Spanish to English-speaking people.

Castle (1963) reported on a study in which a postgraduate medical program was presented on open-circuit educational television. Pretest and post-test results were obtained from 18 physicians and 31 medical students who had viewed the program. The average percent of correct answers

rose from 70 in the pretest to 88 in the posttest for the physicians, and from 64 to 85 for the medical students.

Hennes and Saltzman (1965) presented a series of enrichment units to 570 gifted children to fifth and sixth grade students on astronomy, mathematics, and geography using instructional television. Tests showed that children who viewed the programs scored significantly higher than the control group of 1,000 students.

In England, Belson (1956) conducted several studies concerning instructional television. He found that television programs on BBC produced an increase in viewer's knowledge of French words, phrases, and general information about France.

In Italy, Mura (1961) observed pupils attending an instructional television program, "Non e mai troppo tardi" (it is never too late), over a period of three years. He found very positive results achieved by television in overcoming illiteracy.

Ogawa (1960) let 140 Japanese fifth-grade children watch a television program about the Tokyo-Yokohama industrial area. Comparison of pretest and posttest showed significant increase in the students' knowledge.

Bertran (1962) examined the use of closed-circuit television for training teachers in France. He found that the presentation of a course on television forces the

teacher to be concise, to improve his/her method, and brings out the important points of the lesson.

In an experiment by Gordon (1960), students in 20 Hawaiian schools who had pronunciation problems were taught remedial speech by either television or their regular teachers. The same jury rated the students' tape-recordings before and after the remedial program. Students taught by television had an average gain score of 9.8, as compared with a slight average loss of 0.4 for students taught by their own teachers.

Herminghaus (1957) compared ninth-grade students in a composition class. The students who were taught face-to-face scored significantly higher than the students that were taught by instructional television.

Kanner, Runyon, and Dersiderato (1954) reported on an experiment in which 400 army trainees were taught basic military skills either by television or by conventional instructional instruction. In five of the 17 tests given, the students taught by instructional television scored significantly higher. In the remaining 12 tests no significant differences were found.

Meacham (1963) compared students in a clothing construction class. The instructional television group did significantly better on laboratory performance than the

face-to-face group, although in objective information tests the two groups showed no difference.

Gottschalk (1965) reported that college students learning German from television did significantly better in aural and reading comprehension than students taught by the conventional method. However, the two groups had no differences on written finals.

Stake (1959) compared high school students taught elementary Spanish vocabulary by instructional television to students that were taught face-to-face. The TV group had significantly lower scores than the face-to-face group.

Wetter and Gable (1958) conducted studies concerning televised learning. They reported that junior high school students taught mathematics by television scored significantly higher than students taught by conventional methods.

Jacobs, Bollenbacher, and Keiffer (1961) tested the effectiveness of instructional television in teaching mathematics to below-average junior high students. No significant differences were found between the television and conventional groups on the computation section of the test. In two of the five comparisons on problem solving and concepts, the instructional television classes did significantly better.

Johnson and Harty (1960) experimented with students taught conventually verses televised instruction. They reported that high school students taught face-to-face did significantly better than the students taught by television.

Suchy and Baumann (1960) conducted a three-year experiment in which high school students were taught American history either by television or conventional instruction. In both the first and the second year, the TV group scored significantly higher than the conventional group.

In an experiment conducted by Pinto (1962) in Chile, high school students were taught history of the Middle Ages and modern times. On questions related to interpretation and description, the students taught by instructional television did significantly better than the two groups taught without television.

Johnson (1960) conducted a study regarding student learning by television. He reported that students taught introductory geography by conventional instruction had significantly better achievement than the students taught by television.

Abe (1960) compared two groups of Japanese students randomly assigned to either a television program or to a lecture by the same professor. The program was about

elementary psychology concerning the mind. The lecture group did significantly better than students taught by instructional television.

Boone (1954) was involved in a study involving Naval Academy midshipman. He reported that students receiving instruction on electronics from television scored significantly higher than the students taught by conventional methods.

Macomber (1956) compared television instruction with conventional instruction in a college human biology course. He found that the students taught by instructional television scored significantly higher than the face-to-face students.

Woodward (1964) conducted a study regarding student learning in biology. He reported that the achievement of face-to-face students in biological science was significantly superior to that of students taught by instructional television.

Sykes (1964) compared 58 education majors who had been randomly assigned to a television group or to a control group. The television group watched six art lessons over a six week period, while the control group did not. The post-test showed a significant difference in favor of the television group.

Roy, Schein, and Frisina (1964) tried out a television program that taught 68 deaf students basic typewriting skills. Most children achieved the criterion level of speed and accuracy in " a relatively short time." In another experiment, Frazier and Evans (1960) had 151 teachers and 4,814 third- and forth- grade children in Ohio view ten half-hour television programs on the subject of elementary science. The teachers reported that they gained a significant amount of confidence in teaching the class and that the participating students showed much more interest in science after it was over. However, achievement tests showed no significant increase in the children's scores.

Chu and Schramm state " so far as we can tell from available research evidence, there is no general area where television can not be used efficiency to teach students" (1975, p. 29). Many researchers agree with these statements.

These findings consistently indicate that instructional television is likely to be more effective than conventional methods in teaching primary and secondary school students than college students. However in the absence of more evidence, we can only speculate as to why this may be so. An assumption might be that the higher the grade level, the more complex the material taught, the more

serious will be the lack of immediate feedback and discussion.

Another possible factor is the role of television in the environment in which the student is brought up. Possibly, the younger the student, the more intimately television has been a part of their learning and growing, and the more likely they will be able to learn from the television medium (Chu & Schramm, 1975).

A third possibility is the different preferences for the media by different age groups. For example Ames (1958) got the impression that the TV teacher plays a very important role in motivating and stimulating the student to learn. This suggests that younger students are more likely to prefer instructional television than older students.

The attitude of the teacher must also be considered since he/she can either have a facilitating or hindering effect on student learning. Teachers at the secondary and college level may not like the idea of sharing the classroom with an instructor on television. However, the elementary teacher may be more likely to accept outside help, since their schedule is more flexible and they are less accustomed to the lecture method. Also, the elementary teacher may be grateful for outside help with unfamiliar subject matter (like foreign language) or with visual aids and demonstrations. Therefore, if the

elementary school teacher is more receptive to instructional television than the secondary and college level teacher, we might assume that the students would also be more receptive (Chu & Schramm, 1975).

Various authorities who have reviewed the literature either for publication or for personal use testify that television is an acceptable alternative to traditional methods for providing instruction (Sales,1976; Perrin, 1977; Leveille, 1986; Gerbner, 1986; Reid & MacLennan, n.d.). Chu and Schramm sum up: "There can no longer be any real doubt that children and adults learn a great amount from instructional television . . . . The effectiveness of television has now been demonstrated, in many parts of the world, in developing as well as industrialized countries, at every level from preschool through adult education, with much variety of subject matter and method (1975, p. 32).

CHAPTER 3

SUMMARY AND CONCLUSIONS

Summary

This report had three primary objectives;

1) to discuss the influence of media on learning,

2) to examine the history of instructional television, and

3) to review research and other materials related to the educational effectiveness of instructional television.

It seems reasonable to assume that media are delivery vehicles for instruction and do not directly influence learning. However, certain elements of different media, such as animated motion or zooming, might serve as sufficient conditions to facilitate the learning of students who lack the skill being modeled. Symbolic elements such as zooming are not media but allow us to create sufficient conditions to teach required cognitive skills. The determination of necessary conditions is an appropriate approach when analyzing all instructional problems, and it is the foundation of all instructional theories.

This point of view is in contrast from traditional conceptions of the role of media in instruction and learning. It suggests that systems of symbols that are

correlated only with familiar media may sometimes serve as sufficient conditions for learning from instruction.

Secondly, the great majority of comparative studies show that there is no significant difference between learning from television and learning from conventional teaching; and that where there is a significant difference, it is a bit more likely to be in favor of television than of conventional instruction.

Furthermore, the research seems to suggest that there a number of cases in which instructional television has brought about more learning than the existing level of classroom teaching. The number of these cases seems to be greater than chance. Now, if we can identify the qualities of television teaching that make for maximum learning, perhaps schools can use televised instruction more effectively even in existing classrooms.

Finally, it should be understood that many of the comparisons of television with conventional instruction are of classes taught completely by television vs. classes taught completely by conventional methods. This is an unreal comparison, because almost nowhere in the world is television being used in the classrooms without being built into a learning context managed by the classroom teacher. Some of the most successful uses seem to depend on the studio teacher and the classroom teacher working as a team,

toward the same learning goals. Therefore, the finding of "no significant differences" seems to mean that television can do it's part in this combination, and that one goal of future research and practice is to find what combinations will be more efficient than *either* classroom teaching or televised instruction alone.

Conclusions

One might reasonably wonder why media are still advocated for their ability to increase learning when research clearly indicates that such benefits are not forthcoming. Of course such conclusions are disseminated slowly and must compete with the advertising budgets of the multimillion dollar industry which has a vested interest in selling machines for instruction.

Another equal contributor to this disparity between research and practice is the high expectations we have for technology of all kinds. And, there is the fact that many educators and researchers are reserved about the effectiveness of our educational systems. As environments for learning, media seems to offer alternative and more effective features than those available from the conventional teacher in the conventional classroom. It is important to note however, that it is what the teacher does--the teaching--that influences learning. The point is made, therefore, that all current reviews of media

comparison studies suggest that we will not find learning differences that can be unambiguously attributed to any medium of instruction. It seems that existing research is vulnerable to rival hypotheses concerning the uncontrolled effects of instructional method and novelty.

The following major findings emerged from investigation of the historical background of instructional television and the review of relevant literature.

1. Comparative studies indicate that students taking courses via television achieve, in most cases, as well as students taking courses via traditional methods.

2. Findings of equivalent student achievement hold true even when rigorous methodological research standards are applied.

3. Television is a technological device for transmitting communication and has no intrinsic effect on student achievement.

4. Effective instructional design and techniques are the crucial elements in student achievement whether instruction is delivered by television or traditional means.

5. Recent trends in research are directed toward identifying how best to use the unique capabilities of television to improve education.

The literature in this report strongly suggests that instructional television is an effective mechanism for delivering instruction, but the crucial element in student achievement is the instruction itself. It is not the *how* but the *what* that is important. Research directions in recent years have turned from comparisons between televised and face-to-face instruction, to the examination of instructional methods and the unique features of electronic media to determine how best to utilize them to improve education.

It would appear that instructional television has been the target of much criticism through the years in light of its inability to live up to the plans made by its creators. Although the medium has expanded and diversified along with the technology of the times, there is still much controversy as to how it should be presented and in what context it can best benefit the students to whom it is directed. And in many cases, its critics seem to feel that, since it has not proved to be an overwhelmingly successful answer to some of today's educational dilemmas, it is a failed medium.

However, an open minded evaluation of available research data leads to the conclusion that while ITV is not a solution of immense proportions, it is a potentially valuable teaching tool, which, if given adequate support

and attention, can be a worthy complement to the efforts of America's educational system both now and in the future.

Several factors are considered crucial to instructional television's future success. One of the most important is public relations to foster awareness in combination with vigorous advocacy lobbying efforts. Inservice training availability is also vital. The consideration of priorities, keeping in mind the importance of the content as well as context, must be addressed. Above all, lines of communication must be kept open between the creators and users of ITV so that the teaching/learning process will be recognized and respected as the primary and enduring focus of educational technology.

Much has been learned about instructional television's value in the American classroom setting in the past 50 years. However, many more questions need to be asked in order to reach informed conclusions. We must look to the future for the answers to these questions, for if we continue to look to the past for our models, we will know where we have been, but we may not know where we are going.

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