3-19-1991

Review of Literature on Remote Teaching Technologies and Teaching Effectiveness

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Abstract
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Disciplines
Educational Assessment, Evaluation, and Research | Educational Leadership | Educational Methods | Education Economics

Staff Paper 221

REVIEW OF LITERATURE ON REMOTE TEACHING TECHNOLOGIES AND TEACHING EFFECTIVENESS *

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March 19, 1991

* This review of literature was designed to foster discussion among leaders and citizens regarding an important public issue of concern to Iowans. The research was done to foster enlightened discussions among policymakers and citizens. The authors neither endorse or oppose proposals regarding the issues analyzed.

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REVIEW OF LITERATURE ON REMOTE TEACHING TECHNOLOGIES AND TEACHING EFFECTIVENESS
SUMMARY OF FINDINGS

EDUCATIONAL EFFECTIVENESS

* When learning over television is measured against "conventional or classroom teaching" experiments are difficult to design. The question becomes "What is really being measured?" Is it television against classroom? Teacher against teacher? Or, some interaction of variables? Secondly, it is often difficult to match pupils equally and control all design variables.

* Studies using the best experimental design indicate, the average student is likely to learn as much from a TV class as from ordinary classroom methods--some more and some less--but the overall finding is no significant difference. (Schramm, 1962; Chu and Schramm, 1979;)

* In 1961, Pfieger and Kelly reported on their three year study of 800 public schools comparing television teaching with conventional teaching. They found that there was no significant difference in 637 schools. However, 119 schools showed a significant difference in favor of television taught students and 44 showed a significant difference in favor of conventionally taught schools. (Chu and Schramm, 1979)

* In 1962, Schramm found the following results in a study of 393 experimental comparisons of television teaching versus classroom teaching. (Schramm, 1962)

	No significant difference	**Television more effective**	**Conventional more effective**
Elementary	114	68	21
Secondary	57	12	21
College	84	3	13
TOTAL	255	83	55

* In 1979, Chu and Schramm found similar findings in 421 comparisons of television teaching and classroom teaching. (Chu and Schramm, 1979)

	No significant difference	**Television more effective**	**Conventional more effective**
Elementary	50	10	4
Secondary	82	24	16
College	152	22	28
Adults	24	7	2
TOTAL	308	63	50

* A 1986 Minnesota State Department of Education study reported similar findings of no significant difference in achievement between interactive television students and traditional classroom students. Furthermore, the level of student-teacher interaction was not significantly different from that in traditional classes. (Johnson and Tully, 1989)

* Televised instruction was used with greater success in grades 3-9 than high school or college. (Schramm, 1962)

* Home TV students tend to do better when compared with TV taught students in a classroom. Home students are more likely to be adults who tend to be more highly motivated. (Schramm, 1962; Chu and Schramm, 1979)

CONCERNS

* Discipline in the Interactive TV classroom is of concern to teachers and administrators. (Johnson and Tully, 1989)

* Teachers may feel threatened by Interactive TV - loss of jobs if larger number of students can be taught at one time. Also, they may feel uncomfortable teaching in front of a camera. (Johnson and Tully, 1989)

STUDENT AND TEACHER ATTITUDES

* Elementary students think they learn more from a TV class than do high school or college students. (Schramm, 1962)

* Teachers who teach on TV come to like it, whereas, those not teaching on TV tend to be suspicious of it. (Schramm, 1962)

* Michigan State University uses closed-circuit Instructional TV for high enrollment university courses. Student attitudes in Instructional TV courses were generally positive and rated 2 of 3 Instructional TV courses better than average. (Abel and Creswell, 1983)

* Within 6 years, Arizona State University, using Interactive Television Fixed System increased televised course offerings from 1 classroom networked to 5 receive sites with 18 courses and enrollment of 196 to 4 classrooms with 20 receive sites with 52 courses and over 700 students. Student attitudes toward course instruction was quite favorable. (Wagner and Craft, 1988)

TEACHING EFFECTIVENESS

* Effective teleconferencing (audio and video) requires strategies to bridge the distance between instructor's classroom and remote classroom(s): humanizing, participation, presentation style, and feedback. (Monson, 1987)

* Utah requires teachers teaching over telecommunications networks to complete a workshop on interactive telecommunications teaching. Therefore, teacher selection, training and incentives can be an important variable in comparing remote teachers to direct classroom teachers. (Lacy and Wolcott, 1988)

INTERACTIVITY

* Feedback loops providing interactive communication were incorporated into University of California-Chico campus telecommunications system using Interactive Television Fixed System, microwave, computer, facsimile, slow scan. This real-time interaction improves quality of teacher-student interaction. Examples are explained. (McIntosh, 1984)

* Real-time interactive video or audio communication provides teaching assumptions and design elements more favorable for adult learning than one-way video. (Knowles, 1978: Kidd, 1959)

* Students perceived quality of pre-produced educational video courses tends to increase as interactivity with surrogate classroom instructor increases. (Kniker, 1985)

* Interactive communication strengthens student-teacher rapport compared to one-way video. Some degree of interaction between teacher and student is essential for effective instruction. This is now possible with the newer technologies. (Johnson and Tully, 1989)

USES

* To date, Instructional TV is used mostly for specialized or advanced subjects in public schools. Students are usually academically able and highly motivated. (Johnson and Tully, 1989)

POLICY AND ADMINISTRATION

* Virginia has a special department responsible for approving acquisitions and contracting for all telecommunications services and facilities on behalf of the state. (Commonwealth of Virginia, 1987)

* Virginia has a centralized and coordinated approach to telecommunications that promotes effective use of technology to all state agencies and institutions.

* States differ in the governance and coordination of educational telecommunications. Options are:

- public broadcasting board or commission
- state governmental administrative agency
- lack of any central telecommunications governing system
- self-initiated ad hoc cooperative telecommunications arrangements. (Hezel, 1987)

* Education has not kept pace with business and industry in the use of telecommunications. Less than 10 percent of all educational institutions are using effective telecommunications. America also lags behind foreign counterparts in telecommunications use. (Weinstein and Roschwalb, 1990)

* Telecommunications policy is often a political matter involving powerful interests at the federal and state level. Education professionals rarely are included or consulted when decisions are made by Congress. (Weinstein and Roschwalb, 1990)

COSTS AND COST EFFECTIVENESS

* Costs for different technologies varies.

- ITFS (Instructional Television Fixed Service) is one of the cheapest at $200,000-$300,000 range for initial costs for 4 to 5 locations over flat terrain.

- Common carrier telephone lines require agreements with telephone companies - costs include linking site charges plus a monthly service charge that could come to a total of $200,000 annually for 5 locations within a 20 mile radius.

- Satellite costs can be more expensive. Uplink costs can range from $280,000-$600,000/station. Downlink costs can range from $1,000-$2,000/site.

- Cable costs are about $7,500/mile. A consortium of schools needing 50-60 miles of cable would have initial costs in the $375,000-$450,000 range.

- Fiber optic cable is the most advanced technology, but is also the highest cost option. Fiber optic technology is about 25 percent higher than coaxial cable but has a higher performance level and less equipment is needed to help off-set initial costs. (Johnson and Tully, 1989)

- Start-up costs do not generally include local classroom equipment which costs in the range of $7,000-$10,000 per classroom depending on the technology and equipment used.

- North Dakota bid $30,000 per local access classroom for two-way interactive camera and equipment, excluding digital format converter which costs an additional $37,000.

- Local maintenance costs can include both equipment up-keep as well as salary costs for technical experts.

- Program costs vary widely depending on whether purchased programming or local programming is used and whether classes are interactive or one-way video. For example, program costs for one-way video from the Ti-In Network can range up to $800/student per class. (Johnson and Tully, 1989)

* Federal grants have aided a number of states to implement televised instruction. (Johnson and Tully, 1989)

* Schools using IATV usually require employing someone with technical expertise to maintain the system. (Johnson and Tully, 1989)

* Cost of ISDN (Integrated Services Digital Network), a proposed federal telecommunications system, using fiber optics would have short term costs far exceeding benefits. Authors proposing an educational satellite infrastructure instead. (Weinstein and Roschwalb, 1990)

* Positions on cost-effectiveness of technology varies from extremely expensive and that state involvement should be limited to the position that technology is less expensive than conventional delivery. The middle position is that it is not inexpensive nor does it save money over conventional systems, but that technology provides instruction for areas that would otherwise lack instruction. (Hezel, 1987)

* To counteract excessive costs, Minnesota has developed a cost sharing agreement with business for their fiber optic network. One third of the cost is borne by education, one third by the telephone cooperative, and the remainder by foundation grants and lease arrangements. (Kitchen, 1988)

SUCCESS FACTORS

* Instruction over TV must be highly organized, planned and professional delivered. Teachers must be particularly sensitive to the student and intentionally initiate interaction with students. (Barker and Platten, 1988)

* Most successful TV subject matter areas are mathematics, science, social studies. History, humanities and literature have been less

successful. Language skills and health/safety are in the middle range.

* Among the factors important to success for adult learners through telecommunications are:

- learner-centered focus
- commitment from institutional leadership
- smooth collaborative relationships
- system linkages (federal, state, institution) for sharing resources, information, expertise, political support
- quality instructional materials
- favorable policies (Richardson, 1980)

POTENTIAL PITFALLS

* To use television for learning effectively and efficiently, users need to avoid certain pitfalls that have been evident in the use of television in the past (Chu and Schrumm, 1979):

a. Inadequate planning. Lead time is often inadequate. Use is often controlled by the hardware (getting it financed, delivered, and operating) rather than the software.

b. Inadequate attention given to methods and content of television teaching. Review what needs to be taught and methods used to teach it.

c. Inadequate mastering of necessary skills for effective teaching by television. Teachers need to learn about the medium, practice their teaching skills on TV and prepare for the television class to avoid becoming a talking head. Much of this preparation comes before the class goes on the air.

d. Too little time and money allotted to training for instructional use of television. Requires the understanding of both education and broadcasting. The efficient preparation of classroom teachers for the use of television requires workshop training beforehand and follow-up and in-service help for the first few years of television teaching.

e. Inadequate attention to technical adequacy to equipment maintenance.

f. Underuse of systems. Most systems have unused capacity. Capacity use requires planning. Television is economically more efficient when used as mass medium to its full capacity.

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