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ABSTRACT

A 5-year case study was implemented to evaluate the two-way Carroll Instructional Television Consortium, which utilizes a cable television network serving four school districts in Illinois. This network permits simultaneous video and audio interactive communication among four high schools. The naturalistic inquiry method employed included gathering data through student pre- and posttests, student/teacher surveys, observation, and interviews. Inquiry objectives were to determine system effectiveness, system effects on the teaching/learning process, the level of acceptance of interactive technology, and project success. Preliminary results in the first year indicate, according to student evaluations of technical considerations, that the system has improved; according to improved in both effectiveness and efficiency; administrators and other faculty perceptions show increased satisfaction with the system; and students in remote interactive television classes achieved as well on the posttest as students in live classrooms. Seven references and data collection instruments are included.
(LMM)

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An Investigation of Technological Innovation:
Interactive Television

Presented in a Symposium:

Application of Media Technologies for Naturalistic Research

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An Investigation of Technological Innovation:
Interactive Television

Rhonda S. Robinson

Introduction

According to Curtis and Biedenbach (1979, p.3), "Many critics believe that education is the only major American industry which does not yet make intensive use of modern technologies to reduce its costs and to increase the scope of its services." A project begun in Illinois in August, 1983 is an attempt to utilize new and emerging technologies to increase the effectiveness of the educational process. This project, the Carrol Instructional Television Consortium, was the first cooperative educational program of its kind in Illinois, and was born of the common need of four small rural high schools to offer a full range of academic opportunity to their students.

The Consortium utilizes a cable television network already serving the four districts. The system permits simultaneous video and audio communication between any or all of the four high schools. An instructor in one of the four schools teaches class as they normally would, except there are cameras, microphones and monitoring equipment in their classroom. In the other three schools, students watch the lesson and listen to the instructor on their own monitors, while being seen and heard by the instructor as well as by their counterparts in other schools. The two-way television consortium represents a technologically acceptable method for sharing instructional resources, better utilizing

faculty expertise and more fully serving the academic needs of the students.

The project goals of the Carrol Instructional Television Consortium are:

1. To increase the total number of course offerings available to students enrolled in the participating districts.
2. To provide fully qualified, experienced, and effective faculty to teach advanced level course work in mathematics, science and foreign languages.
3. To motivate and challenge talented and gifted students through association with comparable students from other districts.
4. To promote high levels of student achievement as measured by content mastery of advanced level course work.
5. To increase the efficiency of teacher instructional time in traditionally low enrollment advanced level curricular offerings.

Based initially on these goals, project evaluation was designed as a five year process. The research has broadened some to include many factors of the environment, and to be as complete as possible.

Project evaluation of this scope has inherent many problems. The subjectivity of observation, the lack of control of population or teaching methods, the gaps in communication or cooperation all prevented the researcher from utilizing experimental research procedures which would add more data to the "N.S.D." comparative studies literature. Instead, the design of this research was

based on naturalistic research premises; the outcomes will be non-statistical but rich data about the school environment and the project's success. This study employs a naturalistic paradigm to investigate a technologically innovative project using two-way interactive television as a vehicle to enhance curriculum.

Very few projects involving interactive television have been researched to date, as the technology is fairly recent. Interactive projects in Trempealeau County, Wisconsin and at Texas A & M University have resulted in some study reports (Hartz, 1983; Johnson, 1983) which detail the utilization of the technology and its success. Project reports show "preliminary" data, and show no significant difference between live and interactive televised instruction in cognitive growth.

The Carroll I.T.V. Consortium modeled itself in part after the Trempealeau County project. Evaluation reports from Wisconsin were available in the design of the research for this project.

The previously listed Project Goals are the focus of the research. In order to evaluate whether the five goals have been achieved, research objectives and data collection methods were directed at the goals as well as at more general research objectives.

Purpose

This paper explains the Carroll Instructional Television Consortium, the design of the research being conducted to evaluate the project, and the results evident from data collected to date.

Objectives of the Study

This study was designed to determine:

1. Is an interactive television system effective?
2. Is the teaching/learning process affected by use of interactive television?
3. Is the interactive television system accepted by the teachers, the students, and the school districts?
4. Are the project goals successfully met?

Methodology

A case study was designed to intensively study the status and interaction of the participants and this project. Data is being collected using several different techniques:

1. Student cognitive growth is measure by pre- and post-tests in their subject matter.
2. Students are surveyed four times during the year to evaluate technical aspects of the system.
3. Teachers are observed throughout the year, approximately 75 hours in total.
4. Administrators involved in the innovation are interviewed about their decision-making process and their satisfaction with the project.

The case study methodology includes many separate data collection techniques, as listed. More specifically, evaluation and data collection includes:

1. A comparison of 1984-85 course offerings with 1983-84 course offerings in each participating district by the district

administrator and researcher.

2. Periodic assessments of teacher effectiveness by district administrators and the researcher.
3. A survey of student opinion about teacher effectiveness conducted by the researcher during each quarter of the academic year.
4. A survey of student attitudes and satisfaction conducted by the researcher during the fourth quarter of the academic year.
5. A survey of teacher opinions about student motivation and degree of challenge conducted by the researcher during the fourth quarter of the academic year.
6. Teacher-made tests covering learner objectives identified in course outlines utilized for entry and exit level assessments of student mastery of course content.
7. Analyses of student achievement scores made by the researcher to assess: 1) student growth, and 2) comparison of achievement scores for students located at originating site with those located at remote sites, and with those not in TV classes where available.
8. A comparison made by district administrators of enrollments in the televised classes with enrollments in the same classes taught in individual districts during the previous two years.

Thus, the data collection has been triangulated to include pre- and post-tests, student/teacher surveys, and observation and interviews throughout the project. Guba (1981) suggests that triangulation can improve dependability and transferability of

data collected in naturalistic inquiry. The trustworthiness of observation and interview data can be enhanced by the collection of survey and cognitive growth data, and by the comparison of results gathered by all three methods.

Further explanation of each data source should provide a clearer understanding of the triangulation of data collection.

Two goals of the Carroll Instructional Television Consortium were administrative in nature: to increase total number of course offerings in the four schools and to increase teacher instructional time efficiency. With high school populations under 200, the total number of courses offered each year is limited. Each administrator provided the number of classes offered per school and the teacher assignments, and provided any "paper trail" of course selection procedures and class assignments (meetings with counselors, teachers, and students). Thus, administrator information documented the change in total number of courses available and in teacher/student ratio indicating teacher efficiency.

A third goal of the project was to provide advanced students with effective, experienced teachers. Some schools had no qualified foreign language or business teachers, and others had no fully qualified advanced science teacher. In order to evaluate teacher effectiveness over the system, an observation instrument and schedule were developed. Teachers received five days of in-service training prior to the initiation of the system, and discussion during those sessions was utilized to help develop the

teacher observation instrument. Also, materials from a variety of teacher observation forms were utilized as a guide to rating effective teaching techniques (Salome, 1977). Elements of teaching effectiveness via television were drawn from reports of T.V. teaching studies (Hartz, 1983) and from observation during practice sessions over the system equipment itself. Since teachers were concerned about student perceptions of the course instruction, especially the opinions of "distant" students, questions were added to the student survey; dealing with content presentation and teacher accessibility. Interviews with administrators included teacher effectiveness ratings.

The last two goals of the project involved the real beneficiaries of the system--the students. These goals were to motivate and challenge talented students through enhanced opportunities to interact in upper level courses with other advanced students, and to promote high levels of achievement among these students. In order to collect data related to student motivation, questions were added to the observation instrument, the student survey, and all interview instruments. Pre- and post-tests were designed to indicate levels of student achievement, and to facilitate comparison between student achievement, both in televised and non-televised classes where available, and between on-site and "distant" students in any given class. Pre- and post-tests were developed by the classroom teachers, and were often similar to or the exact final exam given normally in the course. Teachers administered these exams during

the first and last week of classes to all their television students, and to non-television classes where available.

To summarize, project goals were used to direct data collection methods. Where possible, triangulated methods were designed to collect data using more than one method. Observation, survey, and interview were all selected to provide the richest possible data collection and to improve dependability and transferability of data collected. All instruments were developed by the researcher and project participants utilizing discussions, notes from in-service training, and earlier project reports to generate some elements of the instruments.

Results

Results are discussed based upon project goals. Only preliminary data is available, since evaluation will continue throughout the initial five-years of the project. The first year's data has been collected and partially analyzed based upon the project goals and study objectives listed previously. Data was collated from all three sources, and the strength of the data across sources was one area analyzed. However, the first year's data is inconclusive alone, and no statements as to the project's success should be inferred from this preliminary year.

Project Goals:

A) Increase course offerings and teacher efficiency.

Each administrator reported the number of course offerings available to their students. The largest school increased only in number of sections of a course; no new courses were added. The

other three schools increased their course offerings by one to three courses per school, with the smallest school increasing the most. Teacher efficiency was increased in each school.

Instructional time for small classes (3-6 students) was judged as inefficient in previous years. All schools increased class sizes or teacher/student ratio by adding students from the other three schools to the student population "pool" for advanced classes.

B) Provide students with effective teachers.

Teacher effectiveness was extremely important to the project. Teachers were selected by their administrators based upon their years of experience, professional preparation, personality or teaching style, and willingness to participate. In-service activities focussed on mastery of the television equipment and adaptation of lesson plans to television. Teacher effectiveness in the first year was evaluated based upon observation, interview, and the student survey. (See Appendix I for observation instrument and student survey.)

Observation data indicated that the teachers were effective in managing the television equipment, materials distribution, and course structure in their televised classes. Observation of each teacher focussed on their use of the system and their teaching style, class organization, and communication abilities such as eye contact, questioning and feedback. Teachers were rated on these elements, and the ratings indicated growths and improvement throughout the year.

The student survey indicated satisfaction with teacher

effectiveness (See Appendix 2). On a 1 = poor to 5 = excellent scale, teacher effectiveness and accessibility were rated by students. Improvement was noted, especially in accessibility (from an average of 3.45 in October to 4.29 in April). Ease of comprehension of material presented was rated an average of 3.72 in October and 3.77 in April, so some improvement was noted. Teacher and student interviews revealed a wide range of satisfaction with teacher effectiveness, much of which varied from school to school and resulted from technical systems operation problems and student opinions of the system rather than the teacher. Interview data was the most interesting but was also the most difficult to collate, as personalities and individual grades etc. affected the evaluation of effectiveness. Teacher effectiveness was perceived by all three data sources to be above average. However, teacher effectiveness is extremely difficult to evaluate, and the data has not been completely collated.

C) Motivate students and promote high levels of achievement.

Student motivation was indicated by observation and interview. No observed comparisons to student motivation in regular classrooms were available, but participants were asked to compare regular to televised classes.

Motivation was indicated by participation and by ease of understanding on the student survey (Appendix 2). These two elements averaged 3.49 and 3.77 respectively in April. These figures indicate that students felt their participation was only

average, but that their comprehension was above average by the end of the school year.

Student achievement data was collected using all three methods. The pre- and post-test scores were somewhat inconclusive, due to some problems of administration and scoring.

However, average class "gains" in scores on the test indicated that students were learning, and that in several classes, students in "distant" classrooms improved more than those in the teachers' own school. Individual gain and average class gains for each class were recorded for future comparisons. In the second year, comparisons with non-televised classes will also be available.

In summary, preliminary results have indicated:

1. Student evaluations of technical considerations showed that the system itself improved during the first year;
2. Teachers improved in both effectiveness and efficiency throughout the year;
3. Administrators and other faculty perceptions showed increased satisfaction with the system in the first year;
4. Students in remote interactive television classes achieved as well on the post-test as students in live classrooms.

Discussion/Summary

This research was designed as a five year case study, to intensively analyze the status and interaction of the project and its participants. The objectives of the study were to determine 1) the effectiveness of the system; 2) the effect of the system on the teaching/learning process; 3) the level of acceptance of

interactive technology, and 4) the success of the project.

The use of naturalistic inquiry in pursuing these objectives provided for the collection of data in a triangulated design. Data collection has proceeded with all three sources of data providing in-depth and detailed results. Observation has proven the richest source of data; pre- and post-tests were the least reliable source in the first year.

The instruments and their method of administration were altered for the second year of data collection. More questions were added to the student survey, and the researchers had better control of the testing process. These changes should improve the quality and quantity of data collection.

Naturalistic inquiry is a process, not a static technique. Research utilizing multiple data collection techniques including observation has particular strengths and weaknesses. As a methodology, naturalistic inquiry will not definitively prove that this system is more effective than a live teacher, or that interactive television is better than or less effective than other instructional delivery systems. The cognitive growth of individual students measured using more systematic methods would be more quantifiable.

The advantage of this inquiry technique is that it is a process. Much is learned during the data collection about the techniques employed. The quantity and detail of data collected is extraordinary, and the possibilities for collating and reporting are challenging. The study herein describe should provide

reliable, detailed data addressing the four objectives. The richness of the data will provide even more than is required for the continuation of the project, and will certainly establish the level of success of the project relating to its five project goals.

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Appendix I
Part 1

MEMORANDUM

TO: TV Students - Chadwick, Lanark, Milledgeville and Shannon

DATE: May, 1984

RE: Evaluation of system

Now that the television system has been operational for close to a year we would appreciate an evaluation of your experience taking a course via this method.

Please rate on a scale of 1-5

(1 = poor, 2 = below average, 3 = average, 4 = above average, 5 = excellent)

Make additional comments you care to.

Course: _____ Instructor: _____

Your school: _____

1. Was the reception of the picture good enough for following the lecture, copying materials, etc? _____ (1-5)
2. Was the audio satisfactory? _____ (1-5)
3. Do you feel that the talkback feature allowed you to participate effectively in the class? _____ (1-5)
4. Was the instructor accessible to you outside of regular class time? _____ (1-5)
5. Have you been receiving hand-outs, and other materials from the instructor in time for assignments? _____ (1-5)
6. The material presented in this class has been as easy to follow as material presented in regular face-to-face classes? _____ (1-5)
7. Additional comments.

Evaluation of Teaching Performance over Interactive Television

Evaluator _____

From what site _____

Teacher _____

Class originates _____

Class _____

Date _____

Section 1 - Equipment (system) evaluation

- | | Low | | | | High |
|--|-----|---|---|-----|------|
| | 1 | 2 | 3 | 4 | 5 |
| 1. Is starting class a problem because of equipment set-up. | | | | | |
| 2. Does the teacher run an audio and video check before class. | | | 3 | | |
| 3. Are there problems with audio? | | | | Yes | No |
| 4. If yes, please describe. | | | | | |

- | | | |
|--|-----|----|
| 5. Are there problems with video? | Yes | No |
| 6. If yes, please describe those problems. | | |

- | | | | | | |
|--|---|---|---|---|---|
| 7. Does the teacher make effective use of the special effects generator (SEG)? | 1 | 2 | 3 | 4 | 5 |
|--|---|---|---|---|---|

8. How could the teacher make better use of the SEG?

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		Low				High
9.	Does it appear any part of the system is interfering with the teaching/learning process.	1	2	3	4	5

10. Please describe how the system is interfering with the teaching/learning process if applicable.

11.	Does it appear the students are reluctant to participate in class because of the system?	1	2	3	4	5
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12.	Are the students capable of "trouble-shooting" the system?	1	2	3	4	5
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13. If not, what are some of the problems the students are encountering, and at what site?

Section 2 - Instructional style

How does the teacher come across on the system.

14.	<u>Personal traits</u> - projects tack, patience, freedom from mannerisms, etc.	1	2	3	4	5
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15.	<u>Voice</u> - clearness, decisiveness, pleasantness	1	2	3	4	5
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16.	<u>Language usage</u> - oral English, handwriting, spelling	1	2	3	4	5
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Content skills

17.	Knowledge of subject, knowledge of field, ability to develop ideas.	1	2	3	4	5
-----	---	---	---	---	---	---

18.	Planning learning activities - development of objectives in terms of pupils growth in knowledge and understanding of subject.	1	2	3	4	5
-----	---	---	---	---	---	---

19.	Teaching techniques - organization of subject matter, stimulation of student learning.	1	2	3	4	5
-----	--	---	---	---	---	---

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	Low				High
20. Presentation skills - recognition of individual differences, variety of techniques, clarity.	1	2	3	4	5
Did the instructor use good personal techniques for:					
21. gaining and holding attention	1	2	3	4	5
22. questioning	1	2	3	4	5
23. reinforcing	1	2	3	4	5
24. clarifying and explaining	1	2	3	4	5
25. giving directions	1	2	3	4	5
26. use of student ideas	1	2	3	4	5
27. physical (eyes, voice, language, lack of tension, enthusiasm, movement)	1	2	3	4	5
28. Did the instruction fit the time constraints.	1	2	3	4	5
29. Were there clearly defined objectives.	1	2	3	4	5
30. Were the objectives met?	1	2	3	4	5
31. Was there effective closure?	1	2	3	4	5

Section 3 - Misc.

32. Does it appear the teacher is available to work with the students after class?	1	2	3	4	5
33. Did the instructor use supplemental materials?	1	2	3	4	5
34. Did the instructor allow students to participate in class?	1	2	3	4	5
35. Is too much time being spent on record keeping?	1	2	3	4	5
36. Does teacher take time to explain complex concepts?	1	2	3	4	5

37. How long was this class (in minutes)

38. Approximately how much dead time is there?
(no instruction before, during and after
class).

39. Were there unusual or creative touches
which caused the teacher to stand out?

40. Other comments.

Overall-Summary

10/25/83

1. Was the reception of the picture good enough for following the lecture, copying materials, etc.? 3.9
2. Was the audio satisfactory? 3.1
3. Do you feel that the talkback feature allowed you to participate effectively in the class? 3.8
4. Was the instructor accessible to you outside of regular class time? 3.6
5. Have you been receiving hand-outs, and other materials from the instructor in time for assignments? 4.4
6. The material presented in this class has been as easy to follow as material presented in regular face-to-face classes. 3.9

Comments:

In general, the majority of the students enjoyed and found the class interesting; allowing them to experience a broader curriculum.

The most common of negative feedback was that there are problems with the audio and picture reception at times.

Other comments included; the need for another Spanish educated person, other than the instructor, in the class and that the program should be used for smaller classes with approximately eight students at the maximum.

Overall-Summary
(Teacher Present)
10/25/83

1. Was the reception of the picture good enough for following the lecture, copying materials, etc.? 3.7
2. Was the audio satisfactory? 3.3
3. Do you feel that the talkback feature allowed you to participate effectively in the class? 3.3
4. Was the instructor accessible to you outside of regular class time? 4.4
5. Have you been receiving hand-outs, and other materials from the instructor in time for assignments? 4.3
6. The material presented in this class has been as easy to follow as material presented in regular face-to-face classes. 3.5

Overall-Summary
(No Teacher Present)
10/25/83

1. Was the reception of the picture good enough for following lecture, copying materials, etc.? 4.1
2. Was the audio satisfactory? 3.1
3. Do you feel that the talkback feature allowed you to participate effectively in the class? 4.3
4. Was the instructor accessible to you outside of regular class time? 3.3
5. Have you been receiving hand-outs, and other materials from the instructor in time for assignments? 4.4
6. The material presented in this class has been as easy to follow as material presented in regular face-to-face classes. 4.1

CARROLL INSTRUCTIONAL TELEVISION CONSORTIUM

Student Survey
1984 - 85

Your School _____
Instructor _____
Course _____

Did you take a TV course
last year?

Yes

No

Please rate the following questions on a scale of 1 - 5 (1=poor, 2=below average, 3=average, 4=above average, 5=excellent), and make any additional comments you care to.

1. What was your opinion of the TV classes before this class?

no opinion poor idea average idea above average idea

2. Why did you have that opinion? _____

3. Was the reception of the picture good enough for following the lecture, copying materials, and taking notes? _____(1-5)

4. Can you hear the instructor, and the students in the other schools? _____(1-5)

5. Do you feel that the talkback feature allowed you to participate as effectively in this class as in regular classes? _____(1-5)

6. Do you feel as comfortable learning from the TV teacher as you do from a teacher in a regular class? _____(1-5)

7. Is the teacher accessible to you outside of regular class time? _____(1-5)

Please describe when and how the teacher is accessible to you.

8. Do you feel you have an opportunity to get to know your classmates from the other schools as well as you get to know your classmates in a regular class? _____(1-5)

9. Have you been receiving hand-outs and other materials from the teacher in time for assignments? _____(1-5)

10. Do you feel the material presented in this class has been as easy to follow as material presented in regular classes? _____(1-5)

11. How well do you like the TV class? _____(1-5)

12. In general, how well do you like school? _____(1-5)

Are there any additional comments you would like to make?

Thank you for your time and effort.

Please return this survey to your teacher.

Appendix II

STUDENT FEEDBACK/ASSESSMENT

An evaluation of the television system was administered to participating students 3 times during the academic year (1983-84). Each time they were asked to respond to 6 questions concerning logistical and technical considerations of the system. Using a scale of 1 - 5 (1=poor, 5=excellent) they were asked to rank each question. The following are the questions and their corresponding results.

Question #1

Was the reception of the picture good enough for following the lecture, copying materials, etc.?

<u>October</u>	<u>February</u>	<u>April</u>
3.85	3.59	3.70

Question #2

Was the audio satisfactory?

3.13	3.20	3.49
------	------	------

Question #3

Do you feel that the talkback feature allowed you to participate effectively in the class?

3.67	3.35	3.49
------	------	------

Question #4

Was the instructor accessible to you outside of regular class time?

3.45	3.58	4.29
------	------	------

Question #5

Have you been receiving hand-outs, and other materials from the instructor in time for assignments?

4.24	4.29	4.69
------	------	------

Question #6

The material presented in this class has been as easy to follow as material presented in regular face-to-face classes?

3.72	3.46	3.77
------	------	------