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ABSTRACT

In this project, television cameras, monitors, and videotapes were used as direct teaching tools by classroom teachers, with a moderate degree of success, as judged by student achievement and acceptance. Six classroom teachers worked with 80 secondary students and 23 adults, each teacher adapting the techniques of television production to his subject area. Both teachers and students operated the equipment, televising activities in the classroom setting and out of it. An opinion sampling instrument developed for the project was administered, and revealed that: (1) students did not express a high level of confidence that, because of television, a class had taught them "very much"; (2) opinions about the use of television were colored by the way it was used in a particular subject area; (3) correlation was at a significant level among those items relating to dullness or interest, amount learned, and desire to have television used in classes. The experience of the project resulted in the conclusion that all five of the television capabilities utilized--image multiplication, image magnification, image association, image transportation, and image memory--were possible using relatively inexpensive, easily operated equipment. Recommendations centered about the need for paraprofessional aides and mobile units. (MF)

FINAL REPORT

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DEVELOPMENT OF TECHNIQUES FOR UTILIZING TELEVISION IN SECONDARY SCHOOL AND ADULT BASIC EDUCATION CLASSROOMS

WILLIAM A. LINCOLN

Gardner Public Schools
62 Waterford Street
Gardner, Massachusetts, 01440

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DEVELOPMENT OF TECHNIQUES FOR UTILIZING TELEVISION
IN SECONDARY SCHOOL AND ADULT BASIC EDUCATION CLASSROOMS

I. Summary

As the Gardner Public Schools became involved in the use of educational television in 1967, a review of research brought to light the fact that a number of persons had research on the use of externally prepared programs distributed from a central studio location. At that time, however, little research had been done on a technique which was suggested by several sources. Specifically, that technique was the utilization of television cameras, monitors and video-tape units as tools in the hands of the classroom teacher.

This project was designed to investigate that field of endeavor using, as research assistants, six classroom teachers working with 300 secondary students in grades 7 through 12 and 23 adults in Adult Basic Education classes. Their objectives were to develop techniques using cameras, monitors and video-tape recorders as direct teaching tools; appraise the effectiveness of television in secondary school and adult education classes; determine the extent by which television will improve the quality of instruction when operated directly by teachers and students; and specifically investigate five capabilities of television, namely, image multiplication, image magnification, image association, image transportation and image memory.

The research assistants, after meeting with consultants and discussing use of equipment available, worked with the equipment in their classrooms. Each used those techniques which best met his teaching needs in the field he represented. Areas represented were science, mathematics, English and music. Equipment was used to television activities of teachers, students and others, both in the classroom setting for immediate viewing and outside the classroom setting for later viewing. Both teachers and students operated the equipment which included cameras, monitors, video-tape recorders, close-up lenses and lens adapters, zoom lenses, a camera switcher, a special effects generator and various wiring.

A representative sampling of students in classes using television was compared to classes taught by the same teachers before television was available as a classroom tool. Both teachers made tests and standardized tests were used. Also, in evaluating results, an opinion sampling instrument was developed by consultants working with the research team and administered to all students in secondary school classes using television as a direct teaching tool.

I. Summary (continued)

In general, students in classes of teachers using television as a direct teaching tool achieved higher scores on tests than did previous classes of the same teachers before television was introduced. Also, students in classes using television as a direct teaching tool were of the opinion that the tool was not used enough and expressed a liking for television as it was used in their classes.

The opinion samplings, however, also revealed that students did not express a high level of confidence that, because of television, the particular class had taught them "very much". On an eleven point scale ranging from "very little" to "very much", the mean among the 309 students sampled was 6.1715 or only slightly above the median of the scale.

An analysis of variance was done on the several items in the opinion sampling and significant differences among groups in the various subject matter areas appeared, indicating that opinions about the use of television are colored by the way it is used in a particular subject matter area.

A study of correlation among the various items on the opinion sampling (considered to have significance if greater than + or - .3) showed correlation at a significant level among those items relating to dullness or interest, amount learned and desire to have television used in classes. Pupils who felt TV lessons were interesting also felt that they learned because of its use and wanted to be involved in the use of TV in teaching. Those who felt it was dull were not confident that it advanced learning and were not interested in further involvement.

Based on both evaluation and practical experience, it was concluded that television use as defined by the project, presents the classroom teacher with an acceptable teaching tool which students feel adds interest to lessons and is not used often enough.

Also concluded were: (1) All of the five television capabilities utilized, image multiplication, image magnification, image association, image transportation and image memory are possible using relatively inexpensive, easily operated equipment. (2) Of the above capabilities, image memory or video-taping was the most frequently used. (3) While the advantages to equipment presently available outweigh the disadvantages, its use as a direct teaching tool is limited in that setting up equipment is time consuming; and (4) Technological factors such as difficulty in editing, compatibility of equipment and lack of a readily available, quick repair service also limit effectiveness.

I. Summary (continued)

Based on these conclusions , it is recommended that additional investigation would be valuable as it relates to the possible use of the para-professional or teacher aide as a source of setting up and operating television equipment in the classroom setting. The added person with a short period of training could well provide a solution to the problem of time and, in part, technological difficulty.

Also recommended is research in the use of newly developed mobile units with studio oriented capabilities. These units can be transported from place to place in a building or loaded into a station wagon and moved from building to building and are designed around compatible equipment which eliminates certain of the technological problems cited by this project.

Other recommendations center around: (1) development of regional or statewide video-tape libraries, (2) continued efforts to make battery operated, portable units more practical and (3) coordination of classroom television with distribution systems, either within a building or serving several locations.

In final analysis, television is yet to reach its potential as a teaching tool, partly because additional research and techniques are needed and partly because the necessary technological equipment is yet to be refined.

DEVELOPMENT OF TECHNIQUES FOR UTILIZING TELEVISION
IN SECONDARY SCHOOL AND ADULT BASIC EDUCATION CLASSROOMS

II. Introduction

During 1967, the Gardner Public Schools purchased and began to use easily transported one-half inch format television equipment purchased in part with funds for Adult Basic Education under Title III of P. L. 750, and in part with local funds. Included in the equipment were a videotape recorder, four large monitors, one small monitor, two cameras, two zoom lenses, one wide angle lens, close-up adapters, a camera switcher and various wiring. Added to that, in preparation for this project, were two fully portable units carried on a shoulder strap (Sony "Porta-Pack"), three added tape decks, two of which were equipped for electronic editing of tapes, two additional sophisticated cameras with monitor type viewfinders, three added monitors and various wiring.

During the project, a special effects generator was also added. The unit is designed to provide for using two or more signals from cameras, tape decks or off the air. Such techniques as fading; "wiping" from one picture to another; cornering (showing a second image in the corner) and split screen image (showing 1/2 of one picture and 1/2 of another) are possible.

In attempting to use the equipment effectively, it was noted that the staff, with few exceptions, did not readily relate to the equipment except as it pertained to taping and using tapes of broadcast TV programs. This was true for two major reasons: the first being that the one tape deck available, during the first year of the system's existence, was in great demand for the above mentioned utilization; the second being that research and development of methods for utilization of instructional television related primarily to production of programs in a studio situation and the distribution of a prepared program into the school and/or classroom from an outside source.

A review of research done in the field suggested that studio preparation of programs, while evaluated to be effective, had its limitations and presented problems.

Lerke (6) for instance, while noting that "practically all of the common school subjects can be taught acceptably well by television," noted that "elementary school children accept teaching through TV with greater enthusiasm than high school or college students" and Gary (4) suggested that utilization of instructional television can only be effective when it is properly integrated with the teaching purpose and learning methods in the individual classrooms.

II. Introduction (continued)

Others, including Brugger (1) concentrated on the time consuming, expensive nature of the creation of studio based programs and the need for trained personnel and space; and Carpenter (2) suggested that TV tends to be a sterile medium, and that "research could be directed toward shifting emphasis to greater extent than is true at present from extrinsic to intrinsic kinds of motivation". The hope of the particular author would be "to find ways of shifting responsibility from teachers to students and recording the acceptance of this shift".

Diamond (3) presented some interesting arguments favoring "single room television with television, cameras, receivers and students all in the same room". The same source went on to present a review of programs utilizing this particular aspect of audio visual education. The four projects reviewed related to teaching of typing, anatomy, art and science, all at a college level. The combined research pointed the way toward a need for research in direct use of television, cameras, tape decks, monitors, etc., by a classroom teacher in the classroom setting.

Thus, it was the decision of this project that research was needed as it related to placing television equipment directly in the hands of the classroom teacher and/or students and developing techniques for such utilization as a classroom tool. Based on the factor of research by Lorke (6), noting that "elementary school children accept teaching through the TV medium with greater enthusiasm than high school or college students". It was decided that the project would concentrate on secondary school level and with adults to determine whether or not enthusiasm for TV was any greater when TV equipment was utilized as a direct teaching tool.

Of particular interest was work done by Grant and Merrill (5) identifying the six capabilities of television equipment:

1. Image Multiplication which is the simultaneous display of the same information at two or more physically separate locations.

2. Image Magnification or the enlargement of plane dimensions. This can be to a maximum of approximately 50 times the dimensions of the actual object and can approach 100 times by the use of television camera lenses alone, while peaks can be achieved by means of supplementary lens systems such as microscopes.

II. Introduction (continued)

3. Image Association or the simultaneous display of images from two or more live cameras.

4. Image Transportation which is the transmission of an image from or to an otherwise inaccessible location.

5. Image Transformation or the display of attitudes of an object which would not be visible without special alterations, electronic components of the original equipment. The use of ultra-violet light in x-ray are examples of this.

6. Image Memory which is the subsequent display of information originally obtained from a live television camera. This "Instant Replay" feature can be utilized in an effect which stops or slows the action for more critical analysis.

The project hired six secondary school classroom teachers at the junior and senior high school level -- a junior high school science teacher, a junior high school math teacher, senior high school math teacher, two senior high school English teachers and a senior high school music teacher-band director. One of these, the junior high school math teacher, was also a teacher of adult basic education.

Objectives of the program were:

1. Develop "single classroom" television skills and test these skills in a classroom setting.

2. Determine those instructional areas where television is most useful as well as those in which television adds little to classroom performance.

3. Plan and refine lessons using cameras, monitors and recorders and utilize these lessons in a classroom setting.

4. Make visits to non-school settings, schools of education, and other public schools where television has, for some time, been a part of the program.

5. Formulate and write a project report to be made available to other school systems.

6. Correlate use of television equipment with curriculum current in the Gardner Public Schools and, if possible, obtain materials from the publishers of these texts which could be used with our equipment.

7. Specifically utilize five television capabilities as identified in the research.

II. Introduction (continued)

7. a. Image multiplication
   b. Image magnification
   c. Image association
   d. Image transportation
   e. Image memory

Note: Research has also identified a sixth area, image transformation, which is a highly sophisticated skill using ultra-violet light, x-ray, etc., at the present time equipment for such a technique is not available locally.

III. Methods

As was noted earlier, active classroom teachers were hired as research personnel. Their function was to utilize the equipment as it related to the individual subject matter area and grade level and compare results achieved by present classes to achievement of past classes. Also of interest would be the attitudes of students as they related to television utilization by classroom teachers.

Activities varied considerably from teacher to teacher and from subject matter area to subject matter area, in part because of the philosophy of the classroom teacher and in part because of the nature of the subject matter and age of the pupils involved. Therefore, the five major television capabilities identified in the listing of objectives will be discussed followed by a listing of representative techniques used in the subject matter areas represented on the project staff.

TELEVISION CAPABILITIES

Image Multiplication in the classroom setting and directly controlled by the teacher is possible with simple branch cords which allow a TV monitor to be used in more than one location in a classroom or provide for the showing of an image in rooms adjacent to the basic monitor. This is true whether the source of the TV signal is a camera, a tape deck, or, in fact, an outside antenna. This technique was used with considerable satisfaction in that it provided students with a better view of science demonstrations done at a demonstration table. A single camera was focused on the demonstration being done, and students observed the demonstration on a TV monitor and were not forced to crowd around the demonstration area in order to see. This was also used effectively during a science countdown to insure that all contestants and audience had an adequate view of the phenomena on which questions were based and was used to insure that video-tapes being shown by various personnel in the four subject matter areas represented in the project were easily visible to all students in single classrooms, multiple classrooms or auditorium situations.

Image Magnification utilizing television equipment is possible through the use of four simplified techniques. Telephoto lenses (in this instance, zoom lenses) may be used at varied distances from approximately 4 Ft., to several hundred yards. This is of particular value in magnifying images of activities such as playing a musical instrument; action of an actor in a dramatic situation, gross movement or configuration of an animal or plant, etc. Also a very simple technique is the use of added lenses which are attached directly to the primary lens. This technique is effective when focal length is between 6 inches and 4 Ft. Lenses are threaded so that the secondary lens is easy to attach. This was valuable in magnifying handwriting, printing and small pictures and for dealing with detail especially in the field of science. It was found to be particularly useful by the science teacher during demonstration dissections and by the math teachers in developing student taught lessons which were pre-recorded and shown for later analysis by the class.

Also effective for magnification of small items is the use of adapters which extend the distance between the lens and vidicon tube. In general, this technique requires that the lens be less than 6 inches from the object to be magnified and requires intensive lighting. It is possible, using various length tubes as adaptors, to magnify an object 1/4" in diameter to full picture tube size.

The fourth procedure for magnification is the use of a television camera with the microscope. The television camera is simply focused down the tube of the microscope and the resultant magnified image can be viewed on the monitor screen. This technique was of particular use in the field of science in that it provided for close observation by a large number of students at one time and could be used in a fully lighted classroom.

Image Association is possible in two ways, -- one technique is to simply set up two cameras and two monitors and compare the two images (or provide the images from any basic signal, such as a tape deck or antenna system). A more sophisticated technique is possible through the use of a special effects generator described in the introduction. This allows for production of two adjacent images on the same screen. The two images can be the same size or of different sizes and the two pictures can split the screen vertically or horizontally or one can occupy a corner of the screen. Use of the special effects generator, however, requires considerable preparation and wiring, and it is difficult to maintain two images on the same screen of the monitor if the equipment is not carefully balanced.

Image Association (continued)

The technique has value in any situation in which comparison of any two images or objects enhances teaching. The personnel in the project compared life forms such as leaves and animals, and geometric forms to structures using geometric patterns.

Image Transportation of a sophisticated nature was not tested by the project. However, image transportation of a relatively unsophisticated nature was used in that an image could be "transported" from deomonstration table to the class, from one classroom to anotner or from outside an auditorium into the auditorium. The terminology "Image Transportation" implies immediate and direct transportation as opposed to image memory or video-taping. The image transportation capacity of the equipment was valuable in allowing a number of students to view an activity being carried on at a point away from the gathering of students and was of particular value in the junior high school science area in which only one room has a demonstration area.

Image Memory or the video-taping of activities, objects, programs, etc., was used more frequently by the team than any other capacity of the equipment. This capacity, plus instant replay, gives the teacher a highly functional tool. Particular advantages of ability to video-tape are as follows:

1. In that the locally used educational television station allows the system to tape programs for later use, the capacity allows the teacher to video-tape programs and use them in coordination with his own schedule, an advantage over attempting to coordinate the schedule of the school and class to that of the television station.

2. The combination of video-taping and instant replay allows the teacher to carefully analyze virtually any segment of any video-tape. This was found to be of particular value by the English teachers who were able to video-tape segments of plays and carefully analyze factors of drama.

3. It allowed teachers to move out into the community and surrounding areas and bring back video-tapes of scenes, objects and activities. While this capacity certainly is available using other equipment, video-tape is quick, requires no developing and can be done inexpensively in that video-tapes can be erased and re-used over and over again.

REPRESENTATIVE ACTIVITIES.

The project, in addition to its interest in television capabilities in general, was also interested in determining the effectiveness of using television as a classroom tool as it related to several subjects at a secondary school level (grades 7 through 12) and as it related to the adult as a learner. Represented on the project staff were teachers of (1) adults in mathematics classes; (2) junior high school mathematics; (3) high school mathematics; (4) junior high school science; (5) high school English and (6) high school music (general music and band). The main activities of each were as follows:

Adult Basic Education

Adult basic education groups in the city meet in the evening and involve individuals who have not successfully completed the equivalent of an 8th grade education.

Teachers involved with adult basic education pupils are usually teachers from the system. In this particular project, the teacher of adult basic education chosen was a teacher in the field of math who also teaches at the junior high school level. Primarily for adult students, he produced and used a series of "programed" math tapes. The series, totaling 12 hours of viewing, was made by video-taping a modern math teaching machine program using added oral comments and visual stimulus to the program as presented on the machine. The subject of the tapes was the multiplication and division facts. The tape has been used with junior high school pupils in grades 7 and 8, for math 7 preview groups and algebra I preview groups, as well as for the adult basic education sections for which it was initially designed.

The tapes, while providing students with an opportunity to learn arithmetic facts independently, do not leave the student completely on his own in that the teacher maintains some control over the content and the pace at which the facts are presented.

Also produced for students of adult basic education was a guidance tape. As adult basic education pupils complete their work to the point of achieving an 8th grade equivalency, they are in a position to consider working toward a high school diploma or finding other ways to add to their training. Available to them is a Manpower Development Training Act Center in a nearby community. However, in that time of adult age students is at a premium, it is particularly difficult for them to visit such facilities as the MDTA Center because of work commitments.

Adult Basic Education (continued)

In order to give them an understanding of the activities of the Center, a 27 minute video-tape was made showing the types of training available at the center and introducing personnel responsible for training. The tape, used not only with classes of the particular teacher but also with other groups, is a practical way of presenting guidance information, not only compensating for the fact that adult basic education students have little time for travel, but also decreasing the amount of time needed to explain the program in that a tour of the facilities and explanation of the program can be carefully edited to achieve both clarity and completeness. Adults in the program also presented micro-teaching lessons much the same as those discussed on page 12, as they were used with high school math students. Because of adult time commitment problems, however, the practice was of limited effectiveness. Adults simply did not have the time to practice, tape, analyze and retape presentations.

Junior High School Mathematics

In addition to using the programed video-tapes for his adult classes, the above teacher also used them at a junior high school level and student responses were solicited. Typical statements from students were, "I think learning from TV helps in many ways with tables and I wish more schools would have them." "I don't think kids should watch it more than 15 minutes, because they will get bored, but it helped me learn my tables better"; and "I think learning math from television is fun. You get a lot out of it if you don't know your multiplication facts".

The junior high school math teacher in the program also included use of segments of video-tapes of broadcast TV lessons. Reasoning that lessons prepared in a studio for general distribution are designed for a general audience, he edited the order of presentation and eliminated certain content to tailor the lessons to the needs of the particular class, reducing the time needed to use lessons and integrate them into the classroom. Also used in the junior high school math classes were tapes of practical use of mathematics made by high school math classes and described on page 12.

High School Mathematics

A major senior high school mathematics project using instructional television was one in which Algebra I students were invited to spend time after school hours having some of the most difficult concepts of algebra explained to them as individuals. Immediately following the explanation, the student was asked to explain the concept himself, at which time he was video-taped.

Two to three days later when the concept was scheduled to be taught to the entire class, the tape was shown to the class and the student answered questions of classmates after the tape was played.

It should be noted that taping of these micro-lessons of students, while a time-consuming process which often involved several tapings, increased involvement, not only of the students demonstrating the concepts, but also of other students who responded particularly well to explanation by their peers.

Another secondary school math project had the objective of showing students the use of mathematics in the everyday world. Using portable tape equipment in the store, office or place of business, tapes of math on the job were made in the community. For example, a temporary 10 minute tape was made of mathematics used in a pharmacy with the pharmacist explaining the use of math in preparing prescriptions and operating the business of the pharmacy. In addition, the pharmacist gave the teacher a long list of solution problems used in pharmacy, which, together with the tape, motivated a general mathematics class into a study of ratio and proportion and a study of the metric system.

Also used was a tape of approximately 20 minutes of an insurance agent explaining use of math in the insurance field. The particular video-tape motivated the class to a further study of ratio and proportion and was used to introduce a study of use of tables in math since the insurance agent used tables extensively.

Other businesses taped were a loan company, a retail store and an automobile dealership.

While use of the video-tape to bring students an explanation does not serve as effectively as a live presentation by the businessman or a field trip to his place of business, it has the advantage of enabling the teacher to use the person's time efficiently. Also advantageous are the factors that the tape can be used a number of times for different classes or to achieve different objectives and that the teacher is in a position to direct the students' attention by use of the camera.

Technically, the video tapes mentioned were simple to make. The teacher and students merely went to the place of business with a battery operated, portable unit carried over the shoulder on a strap and made the video-tape on the scene. While such programs are very amateur, they are tailored to the class and can be retaped at any time the teacher pleases in that tapes can be erased and re-used with ease.

High School Mathematics (continued)

Using the same techniques, the math teacher also made video-tapes of geometric design with emphasis on construction and of geometric design in nature and architecture. These are motivational in design and are useful in identifying the importance of geometry as a discipline.

While much of the work of the mathematics teachers involved video-taping, the factor of involvement of students and local people as subjects adds interest and emphasis to the tapes and the involvement of students in preparing materials to be used in their classes has motivational advantages.

Junior High School Science

The science classroom provided a number of uses of instructional television, encompassing all of the television capabilities identified in the objectives. No specific attempt was made to introduce the five capabilities artificially. They were simply used as needs dictated their use.

Both students and teacher used video-taping equipment to move out into the community to bring back a record of scientific phenomena such as cloud formations, rock formations, plant structure and movement and adaptation of animals. These were particularly useful as previews for field trips so that student attention could be directed to that which they were supposed to observe during the field trip.

Laboratory demonstrations were frequently televised for easier viewing and to provide for observation of the demonstration in more than one location. Students setting up and completing the demonstration adapted readily to having it televised and pupils viewing it on monitors were not forced to crowd around the demonstration table to see what was going on. The most involved demonstration was the disection of a fetal pig. By using two cameras and a camera switcher, the attention of the class could be changed from the disection to a microscopic slide showing tissue and/or cell structure or from an overall view to a close-up. Thus, the disection could be supplemented quickly and effectively.

Junior High School Science (continued)

Structure of plant parts were enlarged and compared with the two enlargements appearing on separate monitors at the same time. This was also done using a special effects generator to show one enlargement on one half of the monitor and another on the other half but incompatability of equipment made this a process requiring considerable time and technological skill.

The science teacher also conducted a science "count-down" for junior high school students. Various phenomena on which questions were based were video-taped to insure that all being questioned indeed witnessed the same phenomena.

The science teacher also used a limited number of off-air tapes tailoring content to the classroom program.

High School English

Two high school English teachers participated in the project. Their classes involved both general students and college preparatory students so different projects were attempted as they related to the differing needs of students.

As was noted earlier, segments of drama were taped and used for careful analysis. Fortunately, one of the dramatic presentations used in the curriculum (Death of a Salesman) was presented by a nearby theatre group and taped by school personnel. The tape was utilized over a period of time, presented in short segments with frequent stopping of the tape for discussion purposes and use of the instant replay facility to examine and re-examine literary and social implications of the play. The tape in particular was used with "general" students who, when reading the book, had difficulty in mastering the important concepts presented.

The question arises whether such examination in depth of a film type content would not be as effective, or perhaps more effective, using a film. While the project made no attempt to compare effectiveness of video-tape to a motion picture, the main difference lies in the "instant replay" capacity of television equipment, and while most motion picture projectors can be reversed, reversing the film to replay a part of it, or unthreading and rethreading the machine to replay certain segments of the film is not as manageable as rewinding and replaying a segment of tape. Also subjected to careful analysis and tailored to the needs of students were tapes of an educational television broadcast on Hamlet and background information about the play. This, coupled with the reading of the play, was done to enable the students to better identify with both characters and plot.

High School English (continued)

Video-tapes of scenes and objects were made by students and used to encourage imagery writing by peer group students. Such things as leaves, cracks in sidewalks, insects and hydrants were taped and used to encourage metaphors and similes. After using the technique, the teachers expressed the opinion that it has little to offer and that other media serve the purpose more effectively.

Oral talks were taped by the English teachers and students were allowed to determine whether they preferred individual analysis by the teacher or showing of the tape to the entire class. The majority of students preferred to discuss the tape individually.

Also used was the technique of producing topical speeches or presentations by individual students or small groups of students. Through these productions, they attempted to explain, sell or encourage. Involved were writing, production, analysis and, in most instances, retaping. The development of these, as was true of any attempt to produce a program televising students, was time consuming in that more than one video-taping was usually necessary and/or some editing of picture or sound was necessary.

English teachers, in addition to recording productions of a nearby theatre group, also visited points of literary interest such as Concord, Eugene O'Neil's Playhouse in Provincetown, etc., to make their own video-tapes of exactly what they wished to use in their classes.

High School Music

The high school music teacher in the project is also band director and shares the responsibility for encouraging instrumental music in the system with others. To increase this interest, he produced a tape showing the progress made by an instrumental student from his first attempts with an instrument (4th grade) through high school musical experiences. Scenes show elementary school instrumental music classes, an elementary school concert, the junior high school band in rehearsal and concert, and a high school band concert; and students are interviewed on their work in music.

A tape was made by teachers and pupils to accompany a piece of electronic-musique concrete. The music by Varese was composed of tape recorded natural sounds and electrically generated sound. The video tape portion consisted of 26 sequences taped in the Gardner and Boston area.

High School Music (continued)

Each sequence was a scene or object to reflect the mood of the sound sequence of the music. The video portion did not attempt to picture the original sound source of the music, nor was there any attempt made to suggest a program narrative in the video sequences. Since it was felt the music was an abstract expression, the video portion was an attempt to reflect the moods of the musical expression through a visual media.

Also taped by the music teacher was a project showing examples of physical form to be used to illustrate form in music. A car, several buildings and sculpturing were used to illustrate simple and complex forms in the environment. The tape is designed to be used as an introduction to simple and complex forms in music.

In addition to production of tapes for the above purposes, the music teacher used the equipment to compare and analyze musical instruments and ways they are played, arrangement of personnel in bands and orchestras and to tape and use educational broadcasts in his field.

A further project was attempted in conjunction with a computer laboratory and their computer animation facilities. This attempt was to demonstrate facets of musical relationship through computer generated animation and make a video-tape of the music and a visual pattern generated by a computer reacting to the music. Because it became readily apparent that time and knowledge limitations would make it impossible to complete a meaningful tape during the life of this project (because of time and knowledge limitations) the idea was dropped. It is suggested, however, that the ability to use a computer to provide a visual response to a facet of music presents an area for further research.

Note: Personnel in the project developed a number of video-tapes, mostly on a temporary basis in that an activity or program was taped, used for a particular purpose and later erased so the tape could be used for other purposes. A number of the tapes, however, have been maintained and are available on a loan basis through the Instructional Materials Center, Gardner Public Schools, 62 Waterford Street, Gardner, Mass., 01440. A listing of tapes available appears as appendix VII of this report.

IV. Evaluation

In that the project developed techniques and worked with them in a number of areas, it was decided to base evaluation on a combination of factors, an opinion sampling instrument, results of both standardized and teacher made teacher tests and teacher opinion.

The opinion sampling techniques developed by the project team and consultants was administered to 309 pupils involved in classes utilizing television as a teaching tool. It included two approaches, the use of vignettes or short word illustrations of a situation which called for judgment on the part of the pupil and an eleven point scale asking pupils to indicate opinions about use of television in a classroom setting. Two vignettes were used, one at the beginning, the other at the end and 16 scale items appeared on the instruments.

The opinion sampling using vignettes was based on utilization of television as opposed to slides, movies, tape recorders and photographs. In the first illustration students were told, "There is a circus in New York. You have been given all the people and equipment you need to bring a lesson to the class. The lesson must relate to the subject you will study in this class." They were then asked which they would use as first choice. The example was chosen because it was a colorful event which would normally be studied as a cultural and sociological entity and no immediacy is implied.

Results were as follows:

Media	First Choice of
Movies	131
Television	125
Slides	33
Photographs	18
Tape recording	3

The second vignette was based on more immediacy and asked the students to assume, "Senator Kennedy is spending a full day in Gardner to see and discuss local problems. You have chosen to record and bring back to the class a report and have been given all the people and equipment necessary to use any of the following." In the more immediate situation, results were as follows:

IV. Evaluation (continued)

Media	First Choice Of
Television	157
Movies	103
Tape Recorder	36
Photographs	6
Slides	5

In the more immediate situation, television received significantly more first place votes; while in the situation where more time could be assumed available, where color might be of value and other factors could well favor use of a movie, the movie was chosen first by slightly more than was television.

The conclusion drawn is that students judge television to be a quick way to record sound and picture but do not necessarily judge it to be the best way to present a lesson when time allows for the use of film.

A second analysis of the vignettes involves itself with the first of the two, bringing back a lesson on the circus. In this, the English students surveyed preferred movies over television 44 to 35. The science group preferred movies over television 28 to 24, and the general math group at a junior high school level preferred movies over television 37 to 33.

However, in the algebra and geometry groups, where television was most used in the presentation of lessons, the trend was reversed. In the algebra group, television was preferred over movies 13 to 9; and in the geometry group, television was preferred 20 to 13. This leads to the interpretation that students who have actually used television as a means of presenting a lesson gained more confidence in its use as a teaching medium.

In the second vignette involving a report on a senator's visit to the city, all groups preferred television as a first choice.

The other segment of the opinion survey asked students to respond on an 11 point scale, giving their opinions about classroom television in general, and as it was used in the particular year in the particular class.

For purpose of analysis, the eleven point scale, bearing designation A through K on the questionnaire was translated to numbers 1 through 11 with A or 1 expressing a low opinion and K or 11 expressing a high opinion. The results were subjected to analysis by a computer and results are recorded on the sample of the original opinion sampling device appearing as appendix I of this report.

ANALYSIS OF VARIANCES

Based on Analysis of Variance for One Way Design, Version of June 11, 1964, Health Science Computing Facility, U.C.L.A., (7) results of the 16 items were subjected to an analysis of variance to determine whether there were significant differences among groups of different grade levels or in different disciplines.

1. Classes on television are (very dull to very interesting). Mean score - 7.1359

   Classes on television being seen as very dull to very interesting showed a significant difference among groups at the 1% level with English and Science groups feeling that classes on television were more interesting; and general math students showing a significant difference in feeling they were less interesting, a pattern which was borne out in a set of opinions about the boring nature of using television to teach basic arithmetic facts as was noted earlier in the report.

2. If the same lessons had been in color, I would have understood (very much less to very much more) Mean score 6.9612

   This item showed no significant differences among groups and indicated that students did not have significant positive opinions about color TV used in this particular way.

3. I would like television to be used in my other classes (never to very often) Mean score 7.2447

   Desire to see television used in other classes showed a significant difference at the 1% level among groups, with English students showing a desire to see television used in other classes, as opposed to science students who did not show a particularly great interest in seeing television used in other classes.

4. I dislike television (very little to very much) Mean score 2.7055

   Students did not dislike television, and showed no significant differences among groups.

5. Television programs in general are (very dull to very interesting) Mean score 7.1312

5. (continued)

No significant difference among groups was noted and student opinion is that TV programs in general are interesting.

6. I would like to teach this class using television (very little to very much)
Mean score ?.3262

Difference indicated was significant at the 5% level with general math students preferring not to teach classes using television; and English students showing an interest.

7. Television was used in this class (not often enough to too often)
Mean score 4.0378

Significant difference at the 1% level was noted among groups, with students in science feeling that television had not been used often enough in that class. While no information is available on the number of hours that television was used in any class, reports from teachers indicate that it was used frequently and in a number of different ways in the science classes, all of which were held at a junior high school level. While the response may be caused by the age and maturity level of the pupils, there is also an implication that when television is used in a number of different ways, students see more value to its use and desire that it be used more often.

8. Because of television, this class has taught me (very little to very much).
Mean score ?.1715

Student opinion about how much was taught showed a significant difference at the 1% level among groups with credit given to television for amount learned by students in science and English groups, while students in general math and geometry groups indicated that because of television the class taught them little.

9. Commercially prepared television lessons are (very dull to very interesting)
Mean score [illegible].[illegible]505

Opinion among students of commercially prepared television showed no significant difference among groups. However, the factor that the mean score was below the midpoint of the scale would bear out research findings of Lemke ([illegible]) who found that enthusiasm for use of television as a teaching medium lessened among high school students.

10. I understood the lessons taught with use of television (very little to very much)
Mean score 7.5357

When asked to respond to an item on understanding lessons, a significant difference at the 1% level appeared among groups with students in English expressing the opinion that they understood the lessons better and students in general math and geometry showing less optimistic opinion of amount understood as a result of the use of television.

11. I like this subject(very little to very much)
Mean score 7.9579

Liking for the subject showed a significant difference among groups, with students in science and general math showing a considerably greater liking for the subject. In that all of the students in science and general math were at junior high school level, this may have more to do with the age and maturity level of the students than it has to do with any other factors.

12. I can remember items taught on television (very little to very much)
Mean score 6.8900

A significant difference at the 1% level appeared among groups with students in English and science expressing the opinion that they remember lessons much better than did students in the mathematics area.

13. I like television (very little to very much)
Mean score 8.7974

There was a significant difference among groups at the 5% level with general mathematics students liking TV better than did the other groups.

14. Teacher prepared television lessons are (very dull to very interesting)
Mean score 6.4693

Asking students to express opinion as to whether or not teacher prepared results are dull or interesting, showed a significant difference at the 1% level among groups, with students in English and science expressing feelings that such lessons were interesting, and those in the math area, especially general math where programming of the facts was used, showed that they felt such use was dull.

15. I have been in classes where television was used before (never to very often)
Mean score 5.4751

15. (continued)

In math and science at a junior high school level, students indicated they had seen considerably more use of television than had students in English, Algebra and geometry at a high school level; a potential explanation of this is that approximately 40% of all students at the high school level did not attend public schools in grades 7 and 8 where television has been in limited use over a period of three years. This tends to explain the significant difference at the 1% level among groups.

16. I like television as it was used in this classroom (very little to very much)
Mean score 7.0356

Student opinion as to the liking for television as it was used in the particular classroom showed a significant difference at the 1% level among groups, with students in English and science showing more enjoyment of television as it was used in this particular area than did students in any of the areas of mathematics.

In all of the items above, decisions about significance at the 1% and 5% levels were based on a standard "F" table (Fisher Table 6) as printed in Snedecor GW., Statistical Methods, Iowa State College Press, Ames, Iowa, 1956. (8)

CORRELATION AMONG ITEMS

Correlations were done among the various items with some interesting correlations appearing. Correlation was considered to have significance if greater than + or -.3. Items correlating closely with a number of others were as follows:

a. Opinions about dullness or interest of classes on television (Item 1) correlated at a significant level with opinions about:

Number	Item	Correlation
2	added learning because of color TV	+33642
3	Desire to have TV used in other classes	.51211
6	Desire to teach class using TV	.50313
8	Amount class taught because of TV	.42766
10	Increased understanding brought by TV	.45888
12	Ability to remember TV lessons	.51047

a. (continued)

Number	Item	Correlation
14	Interest of teacher made TV lessons	.51310
16	Liking for TV as used in the class	.61104

b. Desire to have TV used in other classes (item 3) correlated at a significant level with opinions about:

Number	Item	Correlation
1	Dullness or interest of TV classes	.51211
4	Dislike for TV (Negative correlation)	-.31645
6	Desire to teach class using TV	.49119
10	Increased understanding brought by television	.33433
12	Ability to remember TV lessons	.35578
14	Interest of teacher made TV lessons	.36765
16	Liking for TV as used in the class	.48353

c. Desire to teach the class using TV (item 6) correlated at a significant level with opinions about:

Number	Item	Correlation
1	Dullness or interest of TV classes	.50313
3	Desire to have TV used in other classes	.49119
8	Amount class taught because of TV	.33970
10	Increased understanding brought by TV	.36935
12	Ability to remember TV lesson	.37515
14	Interest of teacher made TV lessons	.39969
16	Liking for TV as used in the class	.44954

d. Opinions about amount taught because of TV (item 8) correlated at a significant level with opinions about:

Number	Item	Correlation
11	Dullness or interest of TV classes	.42766
3	Desire to teach class using TV	.33970
9	Interest of commercial TV lessons	.33697
10	Increased understanding brought by TV	.40238
12	Ability to remember TV lessons	.48606
14	Interest of teacher made TV lessons	.43470
16	Liking for TV as used in the class	.49975

e. Opinions about increased understanding brought by TV lessons (Item 10) correlated at a significant level with opinions about:

Number	Item	Correlation
1	Dullness or interest of TV classes	.45888
3	Desire to have TV used in other classes	.33433
6	Desire to teach class using TV	.36935
8	Amount class taught because of TV	.49238
12	Ability to remember TV lessons	.57740
14	Interest of teacher made TV lessons	.34811
16	Liking for TV as used in the class	.48777

f. Opinions about ability to remember TV lessons (Item 12) correlated closely with opinions about:

Number	Item	Correlation
1	Dullness or interest of TV classes	.51047
3	Desire to have TV used in other classes	.35578
6	Desire to teach class using TV	.37515
8	Amount class taught because of TV	.48606
10	Increased understanding brought by TV	.57740
14	Interest of teacher made TV lessons	.43900
16	Liking for TV as used in the class	.55389

g. Opinions about teacher prepared television lessons (Item 14) correlated at a significant level with opinions about:

Number	Item	Correlation
1	Dullness or interest of TV classes	.51310
3	Desire to have TV used in other classes	.36765
6	Desire to teach class using TV	.39059
88	Amount class taught because of TV	.43470
9	Interest of commercial TV lessons	.37781
10	Increased understanding brought by TV	.34811
12	Ability to remember TV lessons	.43900
16	Liking for TV as used in the class	.51755

h. Opinions about liking TV as used in the specific class (Item 16) correlated at a significant level with opinions about:

Number	Item	Correlation
1	Dullness or interest of TV classes	.61104
3	Desire to have TV used in other classes	.48353
6	Desire to teach class using TV	.44954
8	Amount the class taught because of TV	.49975

h. (continued)

Number	Item	Correlation
9	Dullness or interest of commercial TV	.30875
10	Increased understanding brought by TV	.48777
12	Ability to remember TV lessons	.55389
13	Presence in classes where TV used	.30032
14	Interest of teacher made TV lessons	.51755

2. Interpretation of Correlation

There was consistent correlation at a significant level among eight items, those relating to learning skills and those relating to desire to use or have television used. In general, pupils who felt TV lessons were interesting felt they learned and wanted to be involved in use of TV in the teaching, learning situation; and those who felt it was dull were not confident that it advanced learning skills and did not want further involvement.

An implication is that television like any other approach to teaching does not in and of itself accomplish the task of teaching. To be a useful tool, which inspires confidence in the learner, it must be used in interesting ways, a factor which must also be true if students are to be inspired to use television equipment as a way of expressing themselves in a teaching situation.

TEST RESULTS

A sampling of students were tested and scores compared with those of classes taught by the same teacher before television equipment was available. Standardized tests were used in mathematics and science and a teacher made test was used in English. Results were as follows.

Mathematics

In the field of mathematics, twenty-five students at grade 8 level were chosen as a test group and twenty-five former students were chosen as a control group. The control group was chosen on the basis of having had the same teacher as the test group before television was in use in the classroom setting (1966-67). Pre and post tests were administered at level 7.9 and 8.9 for both groups and the groups matched on the basis of I.Q. Results showed the following:

TEST RESULTS (Continued)

	Control Group			Experimental Group		
Average IQ	109.30			109.88		
	Pre	Post	Gain	Pre	Post	Gain
Math Comp.	8.32	9.71	1.33	8.45	10.26	1.81
Math Concepts	8.66	9.68	1.02	9.05	10.78	1.73
Math application	8.59	9.60	1.02	8.68	10.29	1.61

Note: All scores based on arithmetic mean and a full, pupil by pupil listing of scores appears in appendixes II and III.

INTERPRETATION OF MATHEMATICS SCORES

There is to be noted a significant difference in gains registered by the experimental group in all areas of the mathematics test as compared to those registered by the control group. It is assumed, however, that the difference in average test scores is partially related to other variables.

Science

In the field of science, a second group of twenty-five pupils was chosen on the same basis as was used in mathematics and compared to a control group, also chosen on the same basis as was true in math. Results showed the following:

	Control Group			Experimental Group		
Average IQ	110.28			110.36		
	Pre	Post	Gain	Pre	Post	Gain
Sci. Achievement	8.84	9.65	.81	7.85	8.98	1.13

Note: All scores based on arithmetic mean and a full, pupil by pupil listing of scores appears in appendixes IV and V.

INTERPRETATION OF SCIENCE ACHIEVEMENT SCORES

The comparison of scores shows that gain among students in the experimental group is greater than in the control group with a difference of 3.2 months of progress. It should be noted, however, that matched groups were chosen on the basis of IQ alone, and the average pre-test scores of the two groups varied by approximately one year.

English

In the field of English, 50 students were chosen on the basis of I.Q. and matched with 50 who were taught English by the same teachers before TV was in use (1967-68) and their scores on a teacher made test in Hamlet compared. Results were as follows:

	Control Group	Experimental Group
Average I.Q.	102.10	102.30
Average score	71.46	76.04

Note: Scores above based on arithmetic mean and a full, pupil by pupil listing of scores appears in appendix VI.

TEACHER OPINION

Teachers in the program were asked to express their opinions about the advantages and disadvantages of the equipment. The two questions, "What, in your opinion, are the major advantages of using television as a tool in the hands of the classroom teacher?" and "What are its disadvantages?" were both open ended and no attempt was made to structure responses. Their comments reflected in the conclusion drawn and recommendations made in the following two sections of this report.

V. Conclusions

In general, it can be concluded that television cameras, monitors, video-tape decks and such specialized equipment as close-up lenses, lens spacing tubes and a special effects generator are valuable tools for direct classroom use by the teacher and students and that pupils are of the opinion that use of such equipment adds interest to lessons and would like to see it used more often both in the classes represented in the project and in other classes.

Student opinion also implied that if television is to be an effective teaching tool, it must be used in interesting ways. Otherwise, they have no confidence in the medium.

It is also true that all of the five television capabilities utilized, Image Multiplication, Image Magnification, Image Association, Image Transportation and Image Memory (video-taping), are possible using relatively inexpensive, easily operated equipment and that classroom teachers, with training, can readily learn to operate the equipment required for the above capabilities of television.

V. Conclusions (continued)

Of the television capabilities utilized, image memory or video-taping was the most frequently used technique and the number of different activities using the capability was greater than the number of different activities using any other capability of the equipment, a result which can be related to the fact that most use of television in the project resulted in production of a video-tape for later use with students (i.e. activities using image magnification, image association and image multiplication frequently involved video-taping as well).

Presently available equipment has several advantages which make it an effective teaching tool.

ADVANTAGES

1. Playback ease enables teachers and students to quickly play a video-tape using instant replay techniques, rapidly move the tape ahead, etc. In actual use, threading and play back is almost as simple as using an audio tape recorder

2. Ease of recording off-air makes this technique one of the most frequently used. As is true in the instances of play back, this is little more difficult than using an audio tape recorder. It should be noted, however, that quality of signal affects tapes recorded off air. Any interference is amplified when recorded.

3. Portability of equipment, while it leaves something to be desired, is an advantage. The "porta-pack" units designed for battery operation are highly portable and the portable tape decks can easily be loaded into a vehicle for movement from one location to another. However, they are cumbersome and it is more logical to place decks and monitors on movable stands so they may be transported from location to location within the same building. This proves an advantage, not only in terms of ease of operation, but also in terms of keeping the equipment in good repair.

4. The equipment proved to be relatively durable for stationary use and for transportation on a stand within the building.

5. Quality of tapes was good though quality was seen to vary with acceptability of the signal. Best tapes were produced live with good lighting. Second level of quality was seen in off-air taping of a good quality antenna signal and a third level of quality could be noted in production of tapes which were duplicated.

6. Materials can be readily recorded or video-taped and, if quality or content is not acceptable, can be as readily erased and retaped.

7. Editing of sound and/or picture content is possible and allows the teacher to tailor programs for the class.

8. The above technological advantages present the teacher with a flexible, easily operated, teaching tool which can, if used imaginatively, extend the effectiveness of the teacher.

DISADVANTAGES.

Equipment presently available, while it has many advantages, still presents technological problems and it can be argued that unless personnel are given the necessary time and technical help to set up and use the equipment effectively, presently available equipment will not be used to its full potential. The technological disadvantages most frequently noted were as follows:

1. Setting up of equipment proved to be somewhat of a problem for the primary reasons.

   a. Sorting out and running the various cords necessary was time consuming, especially when various and any sophisticated equipment were used.

   b. Most locations do not have an adequate number of electrical outlets for use of a combination of cameras, decks, monitors, lights and special effects generator.

2. Electronic editing and duplicating are possible utilizing 1/2 inch tape decks. However, production of sophisticated tapes using these techniques is difficult for the following reasons.

   a. Loss of synchronization usually can be noted at the beginning of every electronic edit.

   b. Distance between the erase head and the recording head causes a number of problems and distance between the two recording heads adds problems. Various techniques can be worked out to deal with this problem, but satisfactory editing still remains a problem because of location of heads.

   c. Electronic editing or duplicating from one deck to another varies with different decks and only careful experimentation with different combinations of decks will aid the user to realize full capacity of the equipment in terms of editing and duplicating .

3. Physical editing also causes loss of synchronization although it is possible to "develop" a tape using a developing fluid so that acceptable synchronization is possible.

4. Compatibility of equipment is far from acceptable. Until such time as a commonality of format is possible and tapes are interchangeable, classroom television will not realize its full potential.

   Another instance of lack of compatibility of equipment appears whenever attempts are made to produce sophisticated tapes using such equipment as a special effects generator.

5. Repair of equipment was a slow, somewhat painful process and in three instances during the life of the project, equipment had to be shipped to the factory in that it could not be repaired by the local sales and service organization. Also a problem was the fact that the equipment was purchased at some distance and was serviced by the sales organization.

6. Battery operated portable units available during the project did not have a playback capacity. Thus, the student or teacher was forced to either take the tape to a playback unit to evaluate it, or carry a playback unit with him. This disadvantage resulted in a number of instances in which teachers discovered, too late, that tapes made on the battery operated unit were not of the quality or content desired.

VI. Recommendations

In that one of the disadvantages of presently available equipment is the time involved in the use of sophisticated equipment, there is a need for investigation of the possible role of the para-professional or teachers' aide. With a short period of training, an aide could set up and operate any of the equipment utilized in the project. The combination of factors suggests that an aide could well be an important factor in expanding effectiveness of utilization of television as a classroom teaching tool.

The disadvantage of lack of compatibility of equipment also suggests an area for further investigation. At the present time, mobile units made up of compatible components, all pre-wired and, in certain instances, tailored to the needs of the purchaser, are being produced.

VI. Recommendations (continued)

These have studio oriented capabilities and can be moved from place to place in a building with ease, or can be loaded into a vehicle as small as a station wagon and moved from location to location. These units could eventually provide a way to eliminate a number of the technological disadvantages suggested by teachers on the research team.

The industry is also producing newly designed, battery operated portable units with a playback capability. It is recommended that without such capability, the portable units will not reach their full effectiveness.

As truly compatible equipment becomes available, videotape libraries could well become a practical reality on a state or regional basis. Videotapes, recorded on an interchangeable format, could then be distributed on a rental or loan basis much as films are. Advantages would be possible in terms of lower cost, need for less storage space and in the flexibility of videotape playback as opposed to film projection.

Most video distribution systems in schools distribute television programs to classrooms from a central location, frequently a studio. As classroom teachers develop skill in using the equipment, it is recommended that distribution systems be designed to allow classroom teachers to originate programs from their classrooms for distribution to other locations. This would lead the way toward increased coordination of the work of a department in a school, increased coordination among departments or, in the event that several schools share a distribution system, school to school coordination of program.

None of the work done in this project involved color television because no color equipment was available. As less costly color equipment becomes available, investigation of its use as opposed to use of black and white TV is indicated.

In final analysis, it is suggested that television, in the hands of the classroom teacher, is a tool, nothing more, nothing less. Like any tool, it will not reach its full potential until it has been fully refined by the producer and until the individual using the tool has developed skill in its use. Both areas of endeavor need additional investigation.

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APPENDIX I

GARDNER PUBLIC SCHOOLS
Gardner, Massachusetts

Dr. David M. Russell
Superintendent of Schools

Mr. William A. Lincoln
Dir. Instructional Services

OPINION SURVEY

Section A

There is a circus in New York. You have been given all the people and equipment you need to bring back a lesson to the class. The lesson must relate to the subject you are studying in this class.

Which of the following would you use as first choice?

SLIDES
MOVIES
TAPE RECORDER
TELEVISION
PHOTOGRAPHS

First choice_____

Briefly tell why_____

_____

_____

If your first choice were not available, which would you use as second choice, third choice and so on?

Second choice_____

Third choice_____

Fourth choice_____

Fifth choice_____

PLEASE STOP AND WAIT

Section B

Please circle one letter to show how you feel about each item. If the item is about use of television in the classroom, it means for this year in this class.

EXAMPLE: I like pizza

Very little — Very much

A B C D E F G H I J K

1. Classes on television are

Very dull — Very interesting

A B C D E F G x H I J K

Mean score=7.1359

2. If the same lesson had been in color, I would have understood

Very much less — Very much more

A B C D E F x G H I J K

Mean score=6.9612

3. I would like television to be used in my other classes

Never — Very often

A B C D E F G x H I J K

Mean score=7.8447

4. I dislike television

Very little — Very much

A B x C D E F G H I J K

Mean score=2.7055

5. Television programs in general are

Very dull — Very interesting

A B C D E F G H x I J K

Mean score = 8.1812

6. I would like to teach this class using television

Very little — Very much

A B C D E F x G H I J K

Mean score = 6.3269

7. Television was used in this class

Not often enough — Too often

A B C D x E F G H I J K

Mean score = 4.6388

Section B (continued)

3. Because of television this class has taught me

Very little — Very much

A	B	C	D	E	F	G	H	I	J	K
					X					

Mean score = 6.1715

9. Commercially prepared television lessons are

Very dull — Very interesting

A	B	C	D	E	F	G	H	I	J	K
				X						

Mean score = 5.5505

10. I understood the lessons taught with use of television

Very little — Very much

A	B	C	D	E	F	G	H	I	J	K
					X					

Mean score = 7.5357

11. I like this subject

Very little — Very much

A	B	C	D	E	F	G	H	I	J	K
							X			

Mean score - 7.9579

12. I can remember lessons taught on television

Very little — Very much

A	B	C	D	E	F	G	H	I	J	K
					X					

Mean score = 6.8900

13. I like television

Very little — Very much

A	B	C	D	E	F	G	H	I	J	K
								X		

Mean score = 8.7974

14. Teacher prepared television lessons are

Very dull — Very interesting

A	B	C	D	E	F	G	H	I	J	K
					X					

Mean score = 6.4693

15. I have been in classes where television was used before

Never — Very often

A	B	C	D	E	F	G	H	I	J	K
				X						

Mean score = 5.4751

Section B (continued)

16. I like television as it was used in this classroom

Very little										Very much
A	B	C	D	E	F	G	X H	I	J	K

Mean score = 7.0356

Please stop and wait.

Section C

Senator Kennedy is spending a full day in Gardner to see and discuss local problems. You have been chosen to record and bring back to the class a report on his visit and have been given all the people and equipment necessary to use any of the following:

SLIDES
MOVIES
TAPE RECORDER
TELEVISION
PHOTOGRAPHS

Which would be your first choice?_____

Briefly tell why_____

_____

_____

If your first choice were not available, which would you use second, third and so on:

Second choice_____

Third choice_____

Fourth choice_____

Fifth choice_____

Grade 7____ 9____ 11____

8____ 10____ 12____

Subject_____

Teacher's name_____

APPENDIX II

CONTROL GROUP IN MATHEMATICS

		Grade 7			Grade 8		
Student Number	I.Q.	Math Comp.	Math Conc.	Math Appl.	Math Comp.	Math Conc.	Math Appl.
1	83	7.2	5.7	5.3	7.8	6.9	6.7
2	88	7.6	6.3	6.7	8.0	6.4	7.5
3	90	7.8	6.8	4.7	7.9	8.5	7.4
4	93	6.4	4.0	4.0	8.4	6.1	5.8
5	93	7.2	6.0	6.1	8.0	4.8	5.3
6	94	8.0	6.9	5.8	9.2	7.6	7.4
7	95	5.8	7.2	8.2	5.8	6.6	7.4
8	96	7.6	6.9	6.3	7.2	7.8	5.8
9	96	5.1	8.0	7.7	8.0	8.2	7.4
10	99	7.8	6.6	8.5	5.8	8.2	9.1
11	100	5.8	4.4	6.7	7.8	8.5	9.8
12	111	8.0	6.0	7.2	9.2	7.8	10.4
13	115	8.8	11.1	11.6	10.8	11.7	10.9
14	117	9.2	10.3	9.1	12.3	12.1	11.6
15	117	8.8	7.6	11.3	11.2	9.2	11.3
16	120	11.5	11.8	9.1	11.7	12.9	11.5
17	120	7.6	9.3	9.1	12.5	11.8	12.1
18	122	7.8	10.7	10.4	10.4	12.3	11.1
19	124	11.3	11.8	11.9	12.9	12.2	12.3
20	125	9.2	12.2	11.6	9.6	12.5	12.3
21	126	9.2	11.4	10.4	10.9	12.1	8.5
22	126	10.9	9.9	11.1	11.2	9.3	11.3
23	127	11.3	12.2	11.6	12.9+	12.9+	12.9+
24	134	11.3	11.1	11.1	12.1	12.9	11.6
25	134	8.4	11.3	10.8	12.9	11.3	12.3
Average	109.80	8.38	8.66	8.59	9.71	9.68	9.69

APPENDIX III

EXPERIMENTAL GROUP IN MATHEMATICS

		Grade 7			Grade 8		
Student Number	I.Q.	Math Compu.	Math Conc.	Math Appl.	Math Compu.	Math Conc.	Math Appl.
1	83	6.6	8.2	6.3	7.2	6.9	7.4
2	85	6.4	5.4	7.4	6.2	9.9	10.4
3	87	7.2	5.7	5.8	8.0	7.6	5.8
4	88	6.6	5.4	6.3	8.6	6.3	7.4
5	90	6.2	6.6	6.3	8.6	8.8	9.8
6	94	9.6	8.2	6.7	11.2	8.8	11.1
7	97	6.6	8.8	7.9	8.9	10.3	10.4
8	98	7.8	6.3	4.4	10.0	8.5	7.4
9	100	5.1	7.2	5.8	6.1	8.2	6.3
10	108	10.8	10.3	8.5	11.9	12.6	11.1
11	108	9.6	11.8	11.1	11.7	12.4	11.6
12	109	10.8	8.4	9.1	11.2	12.0	10.8
13	113	10.0	8.0	9.1	10.8	11.8	8.2
14	114	8.9	8.5	7.2	10.8	11.1	10.4
15	115	9.2	9.2	7.9	10.0	11.6	9.1
16	115	8.6	9.9	11.1	10.4	12.6	11.3
17	116	8.6	8.8	9.8	10.8	12.2	11.1
18	117	6.2	7.2	8.2	8.6	9.9	11.3
19	123	6.8	11.4	11.3	12.1	12.4	11.9
20	125	10.0	11.4	8.2	10.8	12.6	12.5
21	126	10.0	12.0	9.1	12.1	12.0	11.6
22	128	11.2	12.0	12.9	12.5	12.7	12.3
23	130	10.8	11.1	12.1	12.5	12.4	12.5
24	137	8.4	11.6	11.9	12.7	12.9	12.7
25	141	9.2	12.9	12.5	12.9	12.9	12.9
Average	109.88	8.45	9.05	8.68	10.26	10.78	10.29

APPENDIX IV

CONTROL GROUP IN SCIENCE

Student Number	I.Q.	Time of Test 7.9**	8.9**	Gain
1	129	11.5	11.4	-0.1
2	128	11.0	11.0	0.0
3	123	10.2	11.6	1.4
4	122	11.2	11.2	0.0
5	122	11.2	11.0	-0.2
6	121	7.5	8.0	0.5
7	121	12.2	11.9	-0.3
8	119	8.4	11.2	2.8
9	117	10.5	11.6	1.11
10	117	8.4	8.3	-0.1
11	116	6.9	10.0	3.1
12	116	9.3	10.2	0.9
13	113	11.0	12.3	0.5
14	112	8.7	9.1	0.4
15	111	9.3	10.	1.1
16	111	7.0	11.0	3.8
17	107	11.5	11.9	0.4
18	103	6.3	8.0	1.7
19	101	5.5	7.7	1.2
20	100	10.0	9.2	-0.8
21	95	5.6	5.8	0.2
22	90	6.6	5.4	-1.2
23	88	5.4	4.5	-0.9
24	88	6.3	6.3	0.0
25	79	5.0	6.5	1.5
Averages	110.28	8.94	9.75	.71

*Based on Otis Lennon IQ Test
**Based on Stanford Achievement Test Advanced Battery

APPENDIX V

EXPERIMENTAL GROUP IN SCIENCE

Student Number	I.Q.*	Time of Test 7.9**	8.9**	Gain
1	129	11.8	11.8	0.0
2	127	6.2	10.0	3.8
3	123	10.0	10.8	0.8
4	122	6.5	7.2	0.7
5	122	6.9	8.0	1.1
6	121	8.0	10.0	2.0
7	120	8.3	10.6	2.3
8	119	9.8	10.6	0.8
9	118	6.5	8.7	2.2
10	116	11.2	10.8	-0.4
11	116	10.8	10.8	0.0
12	116	8.5	10.0	1.5
13	113	9.8	10.0	0.2
14	112	4.6	5.6	1.0
15	110	10.8	11.4	0.6
16	110	9.2	10.8	1.6
17	107	8.7	9.6	0.9
18	103	8.3	8.5	0.2
19	101	6.7	7.7	1.0
20	99	7.5	9.2	1.7
21	97	6.3	6.0	-0.3
22	95	6.7	9.8	3.1
23	93	3.7	5.0	1.3
24	90	4.0	6.5	2.5
25	89	5.4	5.0	-0.4
Averages	110.36	7.85	8.98	1.13

*Based on Otis Lennon IQ Test
**Based on Stanford Achievement Test Advanced Battery

APPENDIX VI

SCORES ON HAMLET UNIT IN ENGLISH

Control Group 1967-1968			Experimental Group 1968-1969		
Student Number	I.Q.	Hamlet Score	Student Number	I.Q.	Hamlet Score
1	123	81	1	122	86
2	121	90	2	122	85
3	121	81	3	121	86
4	118	85	4	118	71
5	114	73	5	114	88
6	113	81	6	113	59
7	112	73	7	112	70
8	112	81	8	112	92
9	111	66	9	111	60
10	110	55	10	111	76
11	110	77	11	111	88
12	109	81	12	109	72
13	109	88	13	109	59
14	109	74	14	109	65
15	109	81	15	109	76
16	108	85	16	108	88
17	108	69	17	108	88
18	108	81	18	108	79
19	107	69	19	107	93
20	107	69	20	107	92
21	105	51	21	106	75
22	105	77	22	106	67
23	105	81	23	105	60
24	105	65	24	105	72
25	104	65	25	104	85
26	104	87	26	104	82
27	103	69	27	103	72
28	103	69	28	103	77
29	102	50	29	102	67
30	102	81	30	102	95
31	100	73	31	100	85
32	100	81	32	100	75
33	99	81	33	99	87
34	99	67	34	99	81
35	98	47	35	98	87

(continued)

APPENDIX VI (continued)

Control Group 1967-1968			Experimental Group 1968-1969		
Student Number	I.Q.	Hamlet Score	Student Number	I.Q.	Hamlet Score
36	97	77	36	97	77
37	97	77	37	97	68
38	97	85	38	95	61
39	97	54	39	96	81
40	96	74	40	95	70
41	95	77	41	95	80
42	95	77	42	95	57
43	95	76	43	90	80
44	89	57	44	89	67
45	89	74	45	89	35
46	86	77	46	87	80
47	85	50	47	86	82
48	82	57	48	84	72
49	71	34	49	75	64
50	65	57	50	67	73
Averages	102.10	71.36		102.30	76.04

APPENDIX VII

VIDEO-TAPES AVAILABLE

1 Programmed Mathematics series of 12 tapes on multiplication and division facts.

2 Activities of a Manpower Development Training Act Center

3 Mathematics in the Pharmacy

4 Mathematics in Insurance

5 Mathematics in Buying an Automobile

6 Geometric Shapes in Use

7 Instrumental Music, Grades 4-12

The above are available on a loan basis from the Instructional Services Center, Gardner Public Schools, 62 Waterford Street, Gardner, Mass., 01440