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Video Tape Recording: What it is and How it can be Used in the Schools

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IN THE SCHOOLS

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In our modern electronic age, we have been presented with a number of outstanding and extremely useful devices. One such device that has made an important effect on the television industry is the video tape recorder.

When television began to rise in popularity, it was found that there would be certain advantages in having the program taped in advance, the same as had been done for radio with audio tape. However, there was no such device available.

The Ampex Corporation set about making a tape recorder that would not only record the sound, but also the picture. Their engineers made quite a discovery when they found "that while a good sound tape recorder handles from fifteen to twenty thousand electrical impulses a second, a good picture tape recorder would have to handle four million. To fit this appalling number of impulses onto a conventional audio tape, it would mean using up a reel of tape as big as an automobile tire every ninety seconds." (19:19) They solved this problem by constructing a machine with four recording heads. These heads rotate across the tape at the rate of one hundred and six miles an hour. They record on separate channels of a tape that is two inches wide. An entire frame of a television picture is duplicated on a half-inch of this tape, and an hour-long television show can be recorded on a single reel with a twelve-and-a-half inch diameter.

> In its simplest terms, the video tape recorder is a device which records on a strip of magnetic tape the electrical signals which emerge from a television camera system, very much as the familiar audio tape recorder records on a narrow strip of magnetic tape the electrical signal which emerges from a microphone system. All the things which audio tape recording did for sound, the video tape recorder is capable of doing for television; the machine will record both picture and sound, as it is being picked up in the studio, and immediately replay both picture and sound, without a trace of visible deterioration. (10:531)

The video tape recorder is a high fidelity recorder and reproducer of television sound and pictures. It could be accurately regarded as the television counterpart of the professional high-fidelity tape recorder.

One or more television cameras are placed for best picture pick-up. One or more microphones are then placed for picking up the best sound to accompany the picture. As the program is being taped, the cameras are being moved around so as to provide a variety of pictures and the microphones are moved in order to pick up the voices of the people and other sounds in the program accurately. While the program is being recorded, the program is being carefully monitored. If a particular portion does not go smoothly, then it is erased and the scene is shot over again.

One big advantage to using the video tape is that it is a time saver. "(1) The show is edited while it is being shot, not afterwards; and (2) processing is eliminated--you can see the results minutes after the cameras halt." (5:238)

The physical equipment that is necessary to produce a good television broadcast is the same as that used for making a television tape, the difference being that the electrical signal which contains the picture information is fed through cables to the video tape recorder instead of to a television transmitter. (10:531)

Wesley S. Griswold and Martin Mann in their article in Popular Science for February, 1960, give the following description of how the video tape recorder works:

> There must be an enormous amount of electronic information crowded into a small space whenever TV programs are stored on magnetic tape. There might not be any more than 30,000 audio signals per second to record, but there are likely to be more than 3,000,000 video signals per second.
>
> In order to get all this vast number of electrical impulses on tape, the tape has to move very fast. It travels at the rate of about fifteen inches per second. This is not fast enough. So the video recording heads move, too. The combined effect of the tape and recording head movement and tape travel is equal to a tape speed of about fifteen hundred inches per second.
>
> There are four video heads mounted ninety degrees apart on a small wheel that spins at 14,400 revolutions per minute. The heads, only ten mils wide, protrude from the wheel edge like circular-saw teeth. They record in sequence, each taking its turn when it is adjacent to the tape. This leaves video tracks across the tape ten mils wide, with a five-mil space between each track.
>
> The audio signals, not nearly so numerous, are recorded along the length of the tape, as on a home tape recorder, but in a one-eighth-inch band at the top. A tiny extra sound track--the cue track--along the bottom edge of the tape records timing signals, instructions to the operator, and pulses to guide an editor in splicing the tape.

> Going through the Ampex machine, the tape first rounds a full-width erase head. That's to make sure it is completely demagnetized of any previous signals and is ready for a fresh recording. The tape then runs through the video-head assembly, past erase and recording heads for both audio (top) and cue (bottom) tracks, through a capstan assembly that keeps pulling it forward at a constant speed, and around an automatic timer. The tape is forced against the video heads with a pressure of one thousand pounds per square inch. Vacuum holds the tape firmly in place in a concave guide.
>
> When a program has been recorded and is played back for telecasting, the recording heads pick up electrical signals from the tape instead of leaving magnetic patterns on it. These signals are fed from the recorder to a television transmitter, and you see them on your set just as if they were coming straight from the camera. (5:101-2)

In spite of the complexity of the procedure of recording, the video tape recorder, as was previously mentioned, is quite easy to operate. There are some models that are push-button and people without too much mechanical knowledge can operate them very effectively. The maintenance, however, is such that it should be done by someone experienced in the field.

Video tape has been developed to the extent that now it is difficult to distinguish between the "live" programs and ones which are taped.

"The video tape recorder 'remembers' every detail which is fed to it, and will replay in electrical form, the information it has received through cables, over and over, as desired." (10:531)

This new method of recording television programs is much better than one that was developed earlier. This was the kinescope recording. It was done by actually filming the television screen as programs were in progress. The program was not always clear because of loss of picture components in re-playing. Sometimes the voice would be out

of synchronization with the picture. This method, however, was made on a 16mm. film and could then be shown on a 16mm. film projector, whereas the video tape recording requires a tape recorder and television receiver.

A taped program can be repeated a hundred times or more without noticeable loss of clarity. A tape can also be used a hundred different times and erased after each use and still record a very clear picture.

The Ampex Corporation's first video tape recorder in 1956 had a price tag of $45,000. Within five days, in spite of the cost, they had orders totalling more than $4,500,000. (19:19)

In 1958 Ampex came out with a video tape machine that recorded and reproduced in color as well as in black-and-white. The color conversion accessory was a device which could be interconnected with their model Video Recorder--1000. The mechanical operation of the machine did not change. The cost of this converter was $29,000. (2:202)

During this time the cost of video tape recorders was still quite high. It was still out of the question for the schools to purchase one of these. There was experimentation going on to see if there was a possible way of bringing down the cost.

In 1958 another step was made forward when the cost of the recording tape was reduced twice during the year. It dropped from $306.77 for an hour-long video tape to $282.90 and, depending on the quantity purchased, it dropped as low as $248.95. The manufacturer of the tape, Minnesota Mining and Manufacturing, predicted then that further

improvements in manufacturing processes could even bring the cost down eventually to as low as $150 (about where it is today). (22:674)

In 1960 there were two companies manufacturing video tape recorders. The Radio Corporation of America was selling its black-and-white recorder for $52,950. The color attachment was priced at $19,000 extra. The competitive manufacturer sold his black-and-white product for $49,500 with the color unit costing an additional $13,500. (7:71)

Early in 1964 the Ampex Corporation came out with a Minicruiser--a video tape recording center complete in a compact station wagon. It includes a small broadcast video tape recorder in a sliding roof station wagon. Also aboard it is a small camera with zoom lens and two hundred feet of cable to permit camera work away from the cruiser, and an eight-inch preview monitor, and a communications system for the cameraman and the recorder operator. (11:152)

Up until late 1963 the prices on video tape recorders ranged over a wide area. The standard models ranged all the way up to $53,000 and the portable models were ranging from $10,000 to $12,000. These latter machines were of both American and Japanese make.

Recently experiments have been undertaken in England by the Cinerama Corporation which produces the Telcan video tape recorder and in America by the Fairchild Camera and Instrument Corporation. These groups have developed recorders which are within the income of most families in our country and also could be purchased quite easily by the schools. These units are expected to cost anywhere from $175 to $500.

The Telcan video tape recorder is about the size of a bread box. It can record off the air by being directly wired to the home television set. It is very simple to operate. It uses standard quarter-inch triple-play recording tape on oversized reels. A small transistor television camera, costing about $150, could be used to take pictures of home activities and then they could be played back on the home receiver. Also by means of a timing device, television programs could be recorded when no one was home. (8:52)

Another model that is easily adapted to the home is the "Fairchild-Winston Home Video Tape Recorder." It is about the size of a regular sound tape recorder and uses tape of the same quarter-inch width. This model is put out by the Winston Research Corporation, a subsidiary of Fairchild Camera and Instrument Corporation. The unit is housed in a console, which is about the size of a television-phonograph combination. The principal controls of the recorder are push buttons marked "record," "playback," "rewind," "stop," and a knob for "focus." These could be easily reached by lifting a lid in the top of the console. This model will sell for from $300 to $500. The tape costs will be $20 to $30 if made in quantity. This would be less expensive than 8mm. movie film and it is reusable. (6:14)

The two models mentioned previously would not, of course, produce a picture with the quality of the more expensive ones. However, for schools and home use they would work very well.

Before we come to any conclusions about the video tape recorder, let us take a look at how it has been, is being, and can be used in the schools.

Magnetic video tape recording was introduced to education at Station WGBH, the Boston Community Station. This occurred in June, 1958. It was noticed immediately how much these recordings resembled "live" television. It was found that the video tape was just as easy to use as audio tape. In spite of these things, there were several drawbacks. One of these was the cost. An educator at the time stated: "To request one of these machines for the local school would be in a class with a request for the tripling of teachers' salaries." (13:215)

In spite of the cost the University of Texas at Austin was one of the early users of video tape in its classrooms. In one instance it was used in connection with the teaching of eighteen hundred freshmen chemistry students. Formerly the class had a fifty-minute lecture period followed by a three-hour laboratory period. Because of the shortage of teachers and the lack of large lecture rooms, teachers and classrooms were not available to deliver the complete lecture sessions at the many different times required. After the installation of the video tape recorder, the lecture was taped once a week and then played back eleven times. Two 21-inch monitors were placed in each of the nine laboratory rooms and the taped lesson was sent directly into each laboratory, thereby eliminating the use of a large lecture hall. Graduate assistants helped students with the laboratory exercises and were also available to help assist students during the lecture. The regular instructor had, as a result of using this method of delivery, more time for research and for holding individual conferences. (13:216)

The video tape recorder has given tremendous help to the television studio teacher. She can see a re-run of the lesson she has just taught and can judge her own teaching immediately without relying on the criticism of others.

In judging her own performance, the recorder can help the teacher to determine whether or not a visual image would work just as well as a number of words. This could also work in reverse in that the teacher can ask herself if she verbalizes too much.

The teacher can also check the pace of her lesson: Did parts of it drag? Were there parts that needed to be clarified more thoroughly? "By seeing a taped lesson we can judge according to our own goals for each particular portion of the lesson. This aid in pacing involves the speed with which the material is presented; the amount of content; the rate of speech; the time allotted for pupils to write or think; and the amount of time allowed for the development of a particular concept." (20:227)

Through the use of the video tape recorder the teacher can sit back and listen and watch her own speaking to determine whether she talks too fast or too slow, or whether she speaks in an interesting tone with varying inflection, or uses adequate facial or bodily expressions. The teacher could then correct any faults.

Many times a teacher's friends might not tell her whether she has any strange mannerisms or actions that might be annoying to the students.

This again is something that can be viewed by the teacher herself and then corrected.

Many authors stated that this type of review of their own lessons resulted in much encouragement. The teachers have been able to see their own strengths and weaknesses. In this way they can capitalize on their strengths and, through self-observation, can gradually eliminate or greatly reduce their weaknesses.

As one teacher puts it: "Through the use of the recorder, teaching has been revealed in stark reality. An electronic device exposed me and my teaching without our protective shields of good intentions and conscientious endeavor. I stand with my rationalizations, prejudices, and weaknesses clearly revealed before me for just what they are. For, as Robert Burns might have said:

> 'Now some Power the gift hae giv'n us--
> We see oursels as ithers see us.'" (17:228)

In the classroom the video tape recorder can be used in a variety of ways. The immediate playback can be an added stimulus to learning. Through the television playback an entire learning experience can be re-lived and reviewed. This can be done with greater concentration on the pupil's part than just reviewing the lesson. Under the skillful guidance of a teacher, individual and group behavior and actions in listening, observing or speaking can be examined. This can be done with an eye toward better oral and visual communication. (1:733)

Tape recordings of this kind can be of help to the students in self-evaluation in many fields. Performances in public speaking,

dramatics, athletics and other courses can be recorded on video tape. These can then be played back immediately and evaluated. The tapes can be erased or they can be kept until a later date to be used for comparison in showing improvement.

Let us take a look at other applications of the video tape recorder.

In pre-recording lessons: (1) a back-log could be developed for use when the television teacher was unable to be present because of conflict in schedule, illness or other reasons; (2) schedules of outside talent might interfere with viewing time, so lessons could be pre-taped; (3) students outside the viewing area might benefit from television lessons where expense would be too great for microwave interconnections; (4) the teacher could review her own lessons and make any necessary adjustments before presenting them to viewers; and (5) it would be advisable to play the tape of the first performance than to teach the same lesson "live" to another group.

A series of recorded lessons stored on tape could be repeated another semester or even another year. It would be necessary to keep these lessons up to date. This is very easily done. The instructor would merely erase and re-record the section needed to be up-dated or splice in the new material. This would take less time on the instructor's part than preparing and presenting the lesson again at a later date. It would have the same impact on the pupils as a live presentation. The instructor would then have extra time to prepare other lessons.

A permanent school library of documentary materials recorded on tape could be established for inserting into live lesson presentations to add to the educational value of the program. Significant public events could be retained on tape. Visiting specialists, rare physical, social, economic and similar phenomena and events could be recorded, as well as field background information for history, science, industry, etc. Laboratory experiments under the best of conditions and sometimes at great expense to large sponsoring organizations could be taped, also. The time, money and effort spent would be justifiable when it is realized the large numbers that would be viewing these at many subsequent showings.

Video tape recordings can be of various subjects and grade levels. These can be kept in a building library and used for demonstrations of various kinds. In addition to class showings, they can be shown for: (1) parent groups; (2) visiting groups of educators; (3) service clubs; (4) sessions at professional education meetings; (5) teacher-training sessions; (6) board of education meetings; and (7) evening adult education courses. (10:531-2)

There are probably many other uses for the video tape recorder, but each teacher who uses this device could use her own intuition on how she wants to bring it into her teaching.

Mr. Philip Lewis, in his book Educational Television Guidebook, tells how the video tape recording was used on a television program:

> In New York, WCBS-TV's "Sunrise Semester," telecast from 6:30 to 7:30 A.M., was being taped in the afternoon or early evening--not only for the convenience of crews and participants, but also on the basis that "many of today's educational programs....should not be lost after one telecast. In certain subjects--mathematics, history, art, philosophy, languages....it is conceivable that with tape, today's professors may teach the next and succeeding generations. Tape can record forever those teachers with great ability to communicate.' (7:73)

The video tape recorder can be an invaluable aid in the field of education. As has been pointed out, there are innumerable uses for this device. It can assist everyone in the field of education--the administration, special service personnel, activities personnel, the teachers and the students.

Let us now take a look at what some leading audiovisual educators throughout the country have to say about video tape recording.

Edward G. Bernard, Director of the Bureau of Audiovisual Instruction for the City of New York, says that class scheduling difficulties in schools could now be reduced. Programs could even be broadcast when desired.

Henry A. Bern, Head of the Research Department of the Audiovisual Center at Indiana University says:

> The video tape recorder is potentially the most promising educational tool for the analysis and improvement of tasks heretofore considered 'hopelessly' complex. By this means the learner can perform his task and can, immediately afterwards, see and gauge the direction and magnitude of his errors. In other words, the recorder provides the most necessary ingredient in motivated learning--'immediate feedback.'

Malcolm Lee Fleming, Instructor in Education and Supervisor of Motion Pictures at Indiana University, says that there are many uses for video tape recording. Teacher training can come out of the world of books. Students can participate via tape before doing these various things themselves in a classroom.

C. M. Braum, Engineer, Joint Council on Educational Television, says: "In the future video tape recording will be an everyday tool, indispensible in many teaching situations."

Arno de Bernardis, Assistant Superintendent, Portland (Oregon) Public Schools, says that video tape recording in the hands of creative teachers has unlimited possibilities.

James W. Brown, Professor of Education at San Jose State College, says he believes that the video tape recorder will add greatly in providing a variety of essential learning experiences. He further adds that if the spread in the use of this tool was accompanied by a number of trained audiovisual specialists to work directly with teachers to adapt this and other media to educational purposes, the results could be revolutionary. (21:526-30)

Glen Pensinger, Technical Director of the Instructional Television Center at San Jose State College, in an article in the April, 1964, issue of Audiovisual Instruction, best sums up the whole story of the video tape recorder and its uses:

> Lest the bright futures leave an impression that recorded, televised instruction is the be-all, end-all in teaching methods, it should be pointed out that no method is the method; no solution, the solution. The hope for this machine is that it provides the means of adapting television to individual rather than mass problems. What technological laboratories have given us is a flexible, adoptable, instructional tool. If approached with optimism and critical judgment, it promises to be a significant tool in meeting the challenges to education and in raising the quality of instruction as well. In any event, the creativity and inventiveness of the teacher will be the ultimate determinant of its usefulness. (13:217)

In conclusion, I would like to state that I feel the video tape recorder will have a very definite place in the schools. It will be one of our audiovisual aids, just as television, the 16mm. projector and others. It is a tool with unlimited possibilities and a great deal of flexibility. It is a device that can and will be used by teachers at all levels of teaching. It is not an instrument to take the place of the teacher, but, like all audiovisual equipment, is a tool to help the teacher do a more effective job.

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