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The Boulder Valley Public Schools' Utilization of the Proposed Boulder Cable Communications System

John C. Kies

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THE BOULDER VALLEY PUBLIC SCHOOLS' UTILIZATION OF THE PROPOSED BOULDER CABLE COMMUNICATIONS SYSTEM

by

John C. Kies

B.S., The Ohio State University, 1971

A thesis submitted to the Faculty of the Graduate School of the University of Colorado in partial fulfillment of the requirements for the degree of Master of Science

Department of Electrical Engineering

1974
This Thesis for the Master of Science Degree by

John C. Kies

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Date 8/8/74
July 26, 1974

TO: Harold E. Hill
      Robert E. deKieffer
      Ernest K. Smith
      Frank S. Barnes
      The Boulder Valley Public Schools

Sirs:

This project is intended to provide a basis from which the administration of the Boulder Valley Public Schools can determine the processes necessary for thorough consideration and evaluation of a cable education system in the public schools. The intent is not to necessarily answer all questions, but rather to raise those questions which must be answered if a system is to be developed within reasonable parameters.

In the discussion of methods, materials, equipment, personnel and programming every restraint has been applied to retain those parameters to the current state of technology. It is my goal that this project enable the school's administration to achieve a sound, reasonable decision on the questions and opportunities facing them.

John C. Kies
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INTRODUCTION

The Boulder Valley Public Schools find themselves today beset with the problems faced by most schools; a slight decreasing enrollment trend, demands by the community and government for improved and expanded educational opportunities, and a lack of funds caused by a general situation of tight money which inhibits voters from increasing operating levies, much less expansion plans, and a sharply increasing spiral of inflation. Schools in Colorado are hampered even further by the dictates of the Long Bill which limits them to a seven percent yearly expenditure increase, while the fifteen most commonly purchased items by a school system have increased over 14 percent in the last twelve months alone.\(^1\) To add to this problem, the Boulder Valley Public Schools will soon have the opportunity to both improve the quality and diversity of education in the community, and to very likely decrease the unit cost of education through the application of the three dedicated television channels provided to them through the Boulder cable television ordinance. However, the cost of the initial installations and equipment is far beyond the current existing financial capabilities of the Board of Education.
Everyone associated with the schools agrees that the three dedicated channels would be beneficial to have, but no one is certain as to exactly what to do with them. Should all of the schools and all of the classrooms be wired, or only part of them, should all instruction be televised, or only show supplemental materials, and tougher still, who is going to pay for all of this? One might say that it boils down to how much is enough, or do we really need the three channels in the first place?

My particular plan involves a step-by-step progression which should aid in answering these questions. By proceeding in a slow and calculated manner, the system can be evaluated at each step and determination can be made as to whether or not to expand the system at any given point. Partially for this reason, and for others described later, this long-term plan is open-ended and designed for the greatest possible flexibility. It is also intended to be a reasonable plan. At the present time, cable television is still limited to improving reception and providing a greater number of channels in a given geographic area. It is evident that in the near future cable will have the capability to provide many other services; when it does, any cable system should be ready and able to adopt those services if they are desired and needed. Given these two features of cable television, the initial system and any additions must be designed and
built along the lines of current and proven technology. This is especially important to an educational system because of its high public exposure and economic dependence.

It may appear at times throughout this plan that the entire system is devoted to language courses, particularly English. I would like to state initially that this is not the intent. For purposes of examples I have often drawn on my own two years of teaching experience in junior high English. I state this not only with the intent of apology, but to emphasize that these are real problems and real situations that occur every day in schools all over the country. My own experience was near Columbus, Ohio, in the suburban community of Upper Arlington. While Upper Arlington did not have the cultural diversity of Boulder, many other demographic similarities exist such as size, median income and transient population.
POSSIBILITIES; AND PROBLEMS

The largest single difficulty facing the Boulder Valley Public Schools is money. Having to deal with a restricted operations budget and rapid inflation, the schools are having difficulty simply maintaining current programs, much less initiating any that would require a major financial outlay. Despite this, most people involved with the schools, including faculty and local and district administrators, are in favor of the use of cable television as a valuable educational tool.

Even with this generally favorable outlook there are two hesitations or distractions educators will point out. The first is the problem of further dehumanizing the educational process. At the time of the great technological boom of the early to mid-fifties there was a great deal of emphasis placed on science skill development, and the use of mechanized teaching aids to spur on this progress; the whole country was on a science "kick." During that period many schools looked to television and instructional programming to revolutionize teaching. However, in too many instances it was simply used as films had been for years. There was no real innovation. More recently, the trend has reversed itself to where the human element is considered the most important. Schools are
striving to achieve better teacher to pupil ratios and a lessening of the lock-step educational process where all pupils learn the same material at the same rate at the same time. When any form of televised instructional material is mentioned, some educators still have the vision of the course which is delivered to thousands of students over monitors with no human contact save for the person who turns the set on. While this is true in some instances (particularly university lecture courses), this is not the goal of cable television in the Boulder Valley Public Schools. While the cable medium does suit itself for this type of instruction, it is also very adept at actually providing more time for the teacher to devote to small groups and individuals, the goal being for the teacher to actually be able to spend more time per pupil. This can be accomplished by using the cable and video tape recordings to deliver the type of information that tends to be of a lecture nature, and the rest of the class time spent in discussion or individual assistance. While several variables based on this basic idea are possible, consider these two; one, it has been shown that in age groups from junior high and up, there is little or no difference in material retention and learning whether the class is of a "typical" size of 25 to 30 students, or a group up to three times that size. In secondary schools there is a tendency for teachers of a particular
subject to coordinate their teaching to a degree for ease of material access such as films and speakers and to serve as reinforcement and stimulation to one another. For example, if a curriculum in a junior high school includes reading *Huckleberry Finn* in the eighth grade, it is certain that at least half of the teachers involved in eighth grade English will teach the novel at approximately the same time. It is obvious that a great deal of teacher preparation and presentation time is being duplicated. Let us assume that in a given junior high there are four teachers presenting simultaneously the same book unit for a two-week period, with classes meeting for one hour per day, five days per week. Out of this forty hours of class time we can make the modest estimate that twelve hours (30%) is spent in a lecture type of information transferral. This amounts to three teacher in-class hours, and 9 hours of duplication, with no consideration given to preparation time. The same material presented over the cable, with the four classes joined for the one purpose of viewing a particular presentation with two teachers in attendance, would allow the other two teachers one hour of free time each, or in the course of the two-week unit, a total of six additional teacher hours. These hours are not intended to be additional coffee time, but time to prepare their own material to be taped, or developing
additional materials. In the Boulder Schools, with 1,289 teachers, if the above schedule was followed, there would be a total of 18,576 teachers hours saved per year, or to phrase it in a more positive light, 18,576 teacher hours gained.

The second possibility based on the same basic idea is to have an instructional presentation on video tape, but only for a ten to fifteen minute duration, followed by a class discussion. This would not result in the same large amount of time gained as with the other method, but the quality of the material presented would be improved. This statement is based on the concept that with video tape there are a greater range of possibilities for visual aids than a conventional classroom offers. Some of these possibilities might include slides of the author's home, scenes of the Mississippi, and an audio tape of Hal Holbrook's "Mark Twain Tonight," presentations played over still photos of Holbrook and/or Twain himself. While all of these might be employed in a live lecture, they cannot be presented with the continuity of a pre-recorded one. With a live lecture attempting to incorporate these features, the classroom teacher has to take time to adjust lights, seating and to produce-direct and operate two or three pieces of equipment. During the time needed to make these arrangements, the class can lose part or all of the continuity.
With a lecture or presentation of this nature on tape, all the teacher need do in the classroom is introduce the topic and activate the receiver.

While the time spent in preparation for this small tape segment may be greater than that for a live lecture, video tape has a long-term storage capability that allows for its reuse, either in other semesters, or in the library on cassette for the use of the student who either missed or did not understand the concepts of the presentation the first time. This is particularly true in courses that tend to be fact-oriented such as mathematics and any of the sciences.8

While these two examples are limited, they do point out what educators feel is the value of cable education. The teachers believe that television, video tape, or any other electronic medium or machine cannot replace the human teacher, and they are correct. There is no replacement for human warmth, compassion and understanding.9

A study by the National Education Association pointed out a problem for many school systems interested in working with any form of televised instruction; a fear on the part of many teachers that a machine would replace them.10 Cable education would not replace any teacher in the Boulder school system immediately. Certainly, it will first open a few new positions in the production of programming, but teachers will not find
their jobs threatened by cable anymore than they would be threatened by a movie projector. It is possible that with the use of cable (combined with a decreasing enrollment) a slightly smaller number of teachers may be able to maintain the current teaching capability, while increasing the time devoted to individual students. This smaller number of teachers can be achieved through the normal yearly attrition, if desired. In the Boulder schools the situation pointed out by the NEA appears reversed. The teachers in the Boulder area schools are eager for the possibility of working with increased video use and cable as a delivery system. The high schools are each currently equipped with two video tape recorders, cameras and playback units. These units are in regular use and the teaching staffs are asking for more. Boulder and the surrounding area are fortunate in that the physical setting and climate of the area draw many people and the schools have the "pick of the crop" in teacher selection. From the high volume of applications received each year they are able to select only those of the highest caliber, including many who have had training in the use of video equipment and techniques. This becomes important when consideration is given to the production aspect of cable television. If full-time video experts, who were also expert in a diverse number of educational fields, had to be obtained the costs of video
production would skyrocket. By virtue of the fact that much of the planning, design, background and performing of productions can be handled by the teachers, these costs can be held down. The additional benefit arises in that particular offerings can be structured to meet particular needs of teachers and not make them necessarily dependent on what a large general audience of teachers desire.

Another aspect of the awareness of the faculty and staff is in the utilization of cable for areas beyond the strict bounds of classroom instruction. The schools are eager to investigate the possibilities of cable in the areas of extracurricular activities and business meetings. Outside speakers who address the schools or the university are one possibility. Very often there are people in the community who are of interest to many of the students and classes, but due to space, distance and time limitations are unable to attend these addresses. With a portable unit these speakers could be taped, and the program presented at either a more convenient time, or an edited portion presented to a particular class. Another area considered is the make-up of the Boulder community and the diversity of the people employed here. Some of these individuals are very worthy to make presentations to particular classes. An example might be a geology, science or geography class studying
earthquakes. The National Center for Earthquake Studies could provide a speaker on the topic who would be more informative and up-to-date than any textbook possibly could. The time saved the individual is important; by making only one taped presentation he would not necessarily spend as much time away from his work, and as mentioned earlier, that presentation is very likely to be more effective due to the visual and audio effects available. The further possibility exists that during the same school year a similar program would be desired by other teachers in other schools, and the tape can be used again.

The various performing arts have an expressed interest in the use of cable. A particular concert or performance could be taped, and then shown later to either only the students involved, or a more general audience which for various reasons had been unable to attend the live event. This type of programming could be cable-cast during school hours when there are relatively few classroom activities in progress, such as noon hour, and before or after classes. Selected, edited portions of the tapes could be used for instructional purposes and evaluation by both teachers and performers. Similar interest and benefits hold true for athletic departments as well, already one of the biggest users of the current video equipment. The entire school population would
benefit from the taped presentations of athletic events in distant areas where many students are unable to attend.

Other areas suggested for utilization outside of the regular classroom include in-service training for teachers, and meetings of the Parent-Teachers Association. In-service material, whether instructional or informational, could be prepared in advance and presented as a carefully packaged program. This would alleviate the need in many instances for teachers to travel to a central location for material, or for the person presenting material to attend all of the separate buildings, a savings in both time and expense. One example of how this can work is demonstrated by the cable system in Colorado Springs. Instead of all of the teachers traveling to one large auditorium for an address by the superintendent at the beginning of the year, the teachers report to their respective schools and view the pre-recorded tape of the superintendent on their receivers. At the conclusion of the program the teachers are in their buildings and ready to begin the work necessary there. It is estimated that this single program saves as much as four hours per teacher in that particular system. With PTA meetings much the same process could be employed. A large benefit which could be gained here is the distribution of programs and information to the entire
district association, while retaining the benefits of the smaller, single, building meetings. Obviously, not all meetings could be handled in this manner, but the majority certainly could.

Instruction of a specialized nature could also be expanded upon immediate installation of a cable-video tape system. Certain courses which have a low interest rate per school could be expanded to other schools in the district. One example of this is a foreign language. Fairview High School has a competent, qualified Russian language instructor, and a course in Russian is offered in that school. While there is some interest in this particular language in the other high schools in the district, there is not enough to warrant the additional teaching staff. With a cable distribution system, the course could be offered to the other schools on the cable, perhaps live, or with a one-day delay, and those schools outside of the Boulder cable franchise area could receive the session on tape cassettes by bicycling. Student response could be returned in the same fashion. For immediate communication requirements there is also the immediate two-way link offered by the Mountain Bell Telephone Company.

Mr. Noble Freden, Director of Instructional Media, Boulder Valley Public Schools, has suggested other course offerings which could be implemented with televised in-
struction. One is the expansion of vocational-technical courses and adult education by program distribution through the community cable. Students would register for the course for credit, and return material to be evaluated to the instructor by mail. Two courses in the regular curriculum for high schools which could be expanded are film study and film making. Mr. Freden indicated that, in addition to Russian, another language for which there is an expressed interest is German, and there is also a considerable demand for Latin. Other language courses could be developed and presented according to student demand.

In the sciences, Mr. Freden offered that with a color capability, demonstration experiments could be presented more effectively than a live classroom setting because of timing, close-ups, and "instant replay". Televised instruction could also benefit students in the outlying schools by offering courses in advanced sciences and math that are not currently available due to small enrollments. Another benefit would be to the teachers in the smaller schools. With this type of course load the teacher cannot deal as effectively with the subject matter as his peers do with only one subject area.

Mr. Freden feels that one of the greatest opportunities to be made available through the cable is the expansion of a current program, the mini courses. These
are one semester offerings designed to fill a special interest or need. After the semester is ended the course is retained or discontinued, depending on student demand. Through television, and the storage capability of video tape, these courses could be offered to a wider range of students in a number of schools. The instructor's time could be divided over two semesters in order to provide adequate time devotion to all students taking the course. Due to the nature of these special interest courses they would probably not be retained for longer than one year. Some courses currently offered in this program are poetry, literature of a specialized nature such as a certain culture or author, and the science of ecology. Almost any other topic can be considered, as long as there are a sufficient number of interested students. With cable and video tape the number of interested students can be spread over several schools and increase educational opportunity through the entire district (For district course expansions, see Appendix 3).

It is obvious that this is still no substitute for more personalized instruction, but it does provide opportunity where none existed before. It requires mention that it is highly desirable for the instructor to have personal contact at least to a limited extent with the students during the semester.
Within the Boulder Valley Public Schools there exists a very special variety of educational opportunity open to cable education through the Boulder Valley Vocational-Technical School. This is a district school that educates students from throughout the district in specialized skills for immediate placement into the job market. While some work directed toward television and other visual mediums is already taking place there, a cable production and delivery system would provide a two-fold benefit. First, the students there could take advantage of the system, much as in the other schools, and more importantly, the production facility itself could be the source of a new program in vocational education. Through the school's production facility these special students could work with the instructors and staff in the development and production of programming. Besides being an excellent facility for on-the-job training, the school would benefit from the use of these people in place of others who might have to be specially hired to perform these functions. Again, it is obvious that for an efficient and competent facility it is necessary to have a full-time staff of trained professionals, but the students will be able to work under their direction. In addition to the educational opportunities
offered, there is an additional enticement. Under the provisions of Senate Bill 78, and the State Board for Community Colleges and Occupational Education, 50% of the annual cost of operation of the total system will be paid for, providing their standards are met. These standards require that a person trained in these facilities be fully trained and ready to assume a position in the particular industry. Also, for every full-time equivalent student trained in this manner, the school will receive $1,500 per student, per year.¹⁸

To this point, all of the possibilities of cable education appear very positive. However, there are drawbacks. One of these drawbacks might be the parents of the students. If a student returns home from a day of school and reports that he has been watching television, a parent might be concerned that the schools are lax in their duties, and not providing proper education. While it would be an extremely rare occurrence, it is possible, even in the early stages of development of the system, that a given student, on a given day, might be exposed, at least partially, in every class to some televised instruction. While this one instance in itself is not of immediate concern, it will be necessary to develop a community education project to inform the public in general, and parents in particular, as to just exactly what the role of the television set is in the public
schools. In our society, television is viewed as an entertainment medium. While this is only one aspect of the possibilities of television, it is the most familiar aspect. Along these same lines is the very real possibility that some teachers might overuse this new tool, to the point where it does become entertainment.19 This can occur with cable education just as it does with battle-weary lesson plans and the over-use of movies. Consideration was given earlier to the possibility of some tapes being worthy of multiple viewings, even over a period of a few years. For some teachers this could become a crutch to the point where they have an entire course "in the can," and they sit back and just turn the set on. To avoid this, and problems of a similar nature (such as never using this capability) one administrator cautioned that this, as with any new program or tool, must be carefully observed and action taken to alleviate any problem areas. The means for doing this are careful planning by involved departments, very closely set and stated objectives, and if necessary, administrative action such as requiring lesson plans and schedules.20

Some people envision cable education as part of the answer to the current problem of bilingual education. While this is a possibility, it too must be watched and evaluated closely. While special programming can be made available, this type of thinking might actually be
destructive because of the further alienation from human contact for these special students. The positive view here is that if teachers have more time for students as a result of cable instruction, then a portion of that time can be devoted to the bilingual, bi-cultural student for even greater human contact. One high school principal noted that bilingual, bi-cultural programming is indeed very important, but probably more important for the dominant culture student, than for the minority culture student.

While it is important for the parents to be informed about their child's activities and education in the schools, it is also the feeling of most administrators that the schools retain a certain degree of privacy in their instructional material. As stated in the Boulder cable ordinance, the schools are to receive for their use, three dedicated channels which would not be received over the regular cable, except through special converters. This concept is totally suited to the educational community. Most programming would not be a problem if viewed by the general community (with the exception of the lunatic fringe), but consider the possibilities if a tape were being presented on comparative religion, anatomy, birth, birth control, or subjects of a similar nature. This is why the schools prefer the dedicated channels. There are drawbacks to this too, however.
If the system were not on dedicated channels it could provide an excellent public relations instrument for the schools, plus providing instruction in some instances for children not able to attend class due to illness. The possibility would also exist of presenting adult or continuing education on these same channels during the evening hours when the channels would not be as busy. Another factor in this decision is that, at least according to one potential cable operator, with the built-in capacity of the Boulder system, and the number of channels that will actually be in use, there is no technical reason for the Boulder schools to go to a dedicated mid-band channel agreement. This would result in a small cost savings in that receivers without mid-band converters could be used, but this would also require careful screening of material used in the school programs. The author feels the best alternative to either of these arrangements is to have regular school instructional and supplemental material cablecast during the day on the dedicated channels, and if the school system should decide to implement any evening or general community interest programming, to simply not cablecast on the dedicated channels, but to use one of the empty channels in the community cable system. This is a very simple process and one which would suit the needs and budgets. Any use of this type would have to be very carefully
researched and possibly negotiated with respect to the community educational channel which is also provided in the Boulder cable ordinance.

One final problem area must be considered, that of security. Video equipment, both production and reception, is expensive and in some instances delicate. Provision must be made to protect it from both theft and vandalism. If two-way cable becomes a reliable system, then security from theft becomes relatively simple through a burglar alarm system. Until that time, procedures will have to be instituted to protect all equipment. Initially, portable receivers will not constitute a problem, with the exception of a break-in of their storage area. If permanent receivers become part of classrooms, then additional measures will have to be taken.
COLORADO SPRINGS; A CURRENT SYSTEM

In the consideration of any new major development within a school system, especially when the initial cost of that system is expensive, it is worthwhile to examine similar systems that are already in operation in a comparable setting. Colorado Springs Public Schools, District 11, is available for that purpose, having a cable system with three dedicated channels, serving all of the schools in that district with only few exceptions outside the cable area (these are served with bicycled tapes). 26

Instructional television has been a part of the District 11 curriculum since 1965. Cable has been used as the delivery system since 1970. This program is directed almost entirely at the elementary schools, although all of the schools in the district are wired. The main function of the system is to deliver art instruction and science supplementary material. There has been some special production aimed at the secondary level, but only on a limited basis, due to lack of interest by their faculties. One interesting sidelight that developed from the art instruction was an indirect and unplanned in-service program for elementary teachers.
Under the more common system of an art teacher visiting a grade school classroom, the teacher would often leave the room and use the time for preparation, or just a break in the day. With the televised lesson, the teacher remains in the room and then directs the class in work at the conclusion of the program. The result has been a greater awareness and participation in art by the teachers than was ever experienced before, with methods and skills pouring over into other areas of instruction. A similar, though not as dramatic development, has occurred in the science curriculum as well. Teachers who previously might not have emphasized science because of a lack in their own training have the availability to use specially developed materials and base instruction around them.

The decision to use televised instruction of art in the elementary schools was almost an arbitrary one by an assistant superintendent. The schools had decided to include art as a part of the elementary curriculum and methods of accomplishing this were being discussed when the decision to televise was made. It is important to emphasize that at the time there was no standard art curriculum in the elementary schools. Individual teachers were on their own as to whether or not include art lessons. The schools did not decide to televise, and then send existing teachers out in the cold; no one was
released because of the decision. The consideration was based on the 37 elementary schools, and how many new faculty members would be needed to staff the new program. If it would be considered necessary to have one art teacher per elementary school, and if the average qualified teacher would cost the schools around $10,000 per year, you have an expenditure of $370,000 per year in additional salary alone. This figure would not remain static, as salaries would rise with experience and the cost of living. Even if the program could be limited to one teacher serving two schools, the cost is high.

The present system in operation (described more fully below) could be totally replaced for $300,000, plus another $90,000 for receivers and related equipment. This cost comparison makes it obvious why the District 11 Schools decided to televise art instruction.

The district currently operates with one studio and one control room, located in the Instructional Materials Center, adjacent to the Board of Education Building. The studio and control room are fully equipped with professional quality lighting, camera, switching, controlling and recording equipment. The entire operation is handled by six full-time staff members including two professional educators, two professional television persons, a cameraman-technician and a full-time secretary.
All productions are recorded on two-inch quadruplex video tape, and then duplicated onto one-inch helical scan tapes for cable distribution. The two-step process is taken because of the editing and correction qualities of the two-inch tape. Four Ampex one-inch video tape recorders feed the finished productions to the cable company's head end. Other equipment includes four studio cameras (two manual, and two remote controlled), one mobile unit including all lighting and support equipment, and two film chains capable of handling sixteen millimeter and super eight millimeter sound and silent films (as well as film strips), and slides.

All three channels are mid-band between six and seven and are distributed over the community cable system, but require converters on all receivers. These same receivers can be used to pick up regular cable transmissions by disconnecting the converters.

The District 11 facility during the 1971-1972 school year distributed 1,577 individual lessons and programs to elementary and secondary classrooms, professional, supervisory, and curriculum personnel, and classified and support personnel. The facility produced and distributed 105 art and science lessons, (each about 15 minutes in length), 11 in-service education and general information programs (each about
20 minutes in length), and 49 existing half-hour science lessons were extensively edited and partially reproduced to meet changing curriculum requirements. Each school is completely wired in all learning areas, and each school is equipped with between six and twelve receivers, depending on size and need. In addition, each school has its own head end for distribution within the building of special programming on half-inch tape.

At the present time the entire system is black and white only, but plans have been made to convert all equipment to color standards. The estimated cost of this conversion is $150,000-$180,000. Due to the high level of acceptance and enthusiasm in the elementary schools, planning is also being done to expand more into the secondary schools, although aimed more at a supplemental goal, rather than the instructional goal of the elementary schools. One additional aspect of the district's experimentation and development are two schools (one junior high and one elementary) operating on a year-round schedule. The production and distribution facility are currently operating on a nine-month schedule of regularly scheduled programming, but they do provide programming to these two schools on request. Long-term considerations are being made to convert the facility to year-round capability, if the schools decide to implement a twelve-month schedule.
At the present time the three dedicated channels are adequate for the school system's use, but if expansion plans are fully realized, including secondary schools and a twelve-month year, there is consideration being made to expand the number of channels. Until an actual channel expansion can be achieved, it has been suggested that secondary programming be distributed during evening hours, recorded in the schools on their half-inch equipment, and then distributed within the school either on the cable or through an individual room video tape play-back unit.

The District 11 schools are enthusiastic about their system, but emphasize their professional staff of core people and professional quality equipment.
CABLE COMPANY VIEWPOINT

Any realistic consideration of a cable television production and distribution system must include the commercial cable operator; without his interest and cooperation the entire system will not function. It is immediately obvious that without a community system, the financial burden to the school system would be such as to negate any feasibility of cable distribution. It would be conceivable for the schools to develop within each school a closed system and bicycle tapes among each other, but that would be the extent of development. With the cable it is possible to avoid excessive duplication of taped programming and to have simultaneous cable-casting of material. In addition, with cable it becomes possible to expand services to the entire community if desired, and to open totally new possibilities in education when two-way service becomes reality.

In attempting to retain the character of local orientation to the Boulder Valley Public Schools in this project, S.S. Street & Associates were contacted to provide the viewpoint of a local cable television operator regarding the schools' use of cable education. S.S. Street & Associates were selected for this purpose not
only due to availability of decision-making individuals, but because of interest in the community and familiarity with the community and its desires and interests resulting from a year's residence.

With economics always a major concern, it is evident that any cable operator is not going to be able to donate equipment to the school system. This would probably be true in any cable system, but it is especially valid in the Boulder schools due to the demands of the Boulder cable ordinance. The operator must already supply this capability to the government, public, and educational access channels. Any further extension, it is felt, would be economically self-destructive. In spite of this, however, the cable operator would be willing and able to supply technical advice and assistance. This would be especially important during the planning, construction, and initiation of service phases. Additionally, this same technical support can be maintained throughout the life of the cable system.

This in itself provides a strong incentive for the school system to develop their system while the general system is being constructed. In addition to this incentive are two others. One, the cost of construction of the physical cable plant can be reduced slightly if the schools are wired at the same time as the rest of the city. There is also consideration of the condition of everything
being a total system without interconnection, technical standards, and equipment compatibility becoming a problem at a later date. The second major incentive is in the construction of studio facilities. While there would be advantages to the school system to have a separate studio facility, preferably located near the administrative offices and vocational-technical school on East Arapahoe, there are several drawbacks. First, it is a considered opinion that for ease of access and head-end geographical location (for the community cable system), a studio facility in the downtown Boulder area is the most desired. Second, the expense of constructing and maintaining a separate building, or remodeling an existing one, can add appreciably to the initial cost of the system. The suggested alternative is for the school and the cable operator to jointly construct and use a single facility. This too could involve construction cost, but it is hoped that an existing location can be utilized. The costs of both the facility and equipment (including construction, maintenance and overhead) can be shared by the operator and the schools. The exact proportion to each would have to be determined through negotiations, giving special consideration to the profit motive of one, and the non-profit motive of the other. The idea of shared studio facilities is economically sound and technically simplifies programming delivery. The schools, in their course of
future development of the cable system, may find it appropriate to build and maintain separate facilities. That being the case in the future, they would still have existing facilities to use until new ones could be constructed, thus maintaining their programming schedules.

One final concern of the possibility of shared studio facilities goes back to the vocational-technical aspect. If the interest and need of vocational training in television production, maintenance, and cable-casting develops past the capability of the school's facility, there exists the opportunity to expand the training into the commercial studios.

With the cooperation of the cable operator, not only will initial development be simplified, but also additional expansions. As new techniques and opportunities open for cable television, the schools can expand, if needed and desired, along with the community cable, benefiting the same as in initial building. Also, moving in this manner, the schools can be assured that they will not overstep technological bounds of proven equipment and design and purchase inefficient or undesirable components.27
THE PHASE PLAN; INTRODUCTION

The suggested cable education system here offered is designed to allow for the greatest flexibility. This flexibility is intended to be present not only in equipment, but also in the utilization of the equipment. The flexibility in the design also allows for a number of factors to be considered before any changes are effected in the system. One of these is technology. A public school system is a very exposed portion of any community's tax expenditure. If equipment were purchased which was not efficient, or for any reason could not be justified, the public would tend to view any future expenditures with suspicion, and possibly with reservations which could come about in tax appropriations. Considered in much the same vein is expense of equipment, personnel, or programming. Perhaps the most important factor, though, is a constant method of evaluation of the total system and its benefits. The Boulder Valley Schools, or any other school system, could build an elaborate, multi-channel production and delivery system for all types of programming, as long as they had the funds to do so. However, all of that could be a total waste of time and money if it served no effective purpose. All of these factors must be considered with any new educational
program, but especially so with televised instruction due to the high costs involved. This is why, in the evaluation of a cable education system, the evaluation must be continuous, and it must start before any other work or consideration is given the system. It is for these reasons that the systems described are flexible and open-ended. Any exact determination must be made by the school's administration based on desirability, need, and economic capability. The system is based on a phase or modular concept, such that additional development can be planned several years in advance and constructed only after careful evaluation of existing use and proposed future use. As stated previously, before any consideration is given to the use of cable education the public schools must determine, based on possible use and expense, whether or not they need and/or want this type of system. If the schools make a positive decision on this matter, they must then decide which steps to take, and in which order to take them. While the final decision is ultimately in the hands of the school administration, it is important to have input from several sources which would be immediately involved with the system, including teachers, students, the cable operator, parents and other school districts which either have similar systems or are contemplating them. This input can aid in the determination of how far and how fast to go.
PHASE ONE

Any initial cable education system must consist of three basic components: origination, delivery and reception. In the particular instance of the Boulder Valley Public Schools the delivery sector is predetermined by the Boulder Cable Television Ordinance which requires the cable operator to provide to the schools three dedicated channels. As mentioned in the section pertaining to the cable operator, there are two options open to the schools, either three mid-band channels requiring converters, or three channels on the regular community system which are unoccupied. The additional possibility remains of using the dedicated or mid-band channels during the day, and switching to the open channel for evening use in the general community.

While there are three channels available, it is not necessary to utilize all three at once, or to utilize them continuously during the day. In order for the three channels to not be automatically reverted to the cable operator at the end of the five-year experimental period, the schools need only have programming two hours per day, five days per week, per channel. The use of these channels is free to the schools up to the five-year date. After that, during negotiations, it is hoped that free use
can be retained. In any event, the initial delivery system is set.

Origination is the next concern. For Phase One it is suggested that program production and delivery be limited to the high schools of the district. Through the high schools' curriculum diversification the opportunity exists to experiment with a variety of programming possibilities. These include the use of both supplemental and instructional materials.

Under the area of supplemental materials there exists the possibility of the use of current materials such as films, slides, and film strips. While it is obvious that these are readily available in the classroom, this type of usage would provide the opportunity to study two benefits; one, assuming that many standard curriculum offerings (such as basic science, math, English, and history) tend to use the same texts and teachers follow the same general outline, this would allow for the study of a central library for visual materials distribution and the effects of increased interdepartmental cooperation. Second, the effect upon students viewing of traditional visual materials on a televised basis can be studied.

The next concern of supplemental materials are those developed specially for cable distribution. This includes the special type of developed material as mentioned in the second section of this project, including
special demonstrations and speakers. Going beyond that mention, there is the opportunity to draw upon the teachers in the various schools who have a special talent, capability or personal experience in a specialized field. This type of presentation would not be available to all of the high school students in the district because of the time and distance limitations of a given teacher's schedule. A taped presentation can provide that opportunity. An example of this sort of specialty could be a music instructor who spent a summer at the Aspen music festival and developed instructional material based on that experience. Looking to the community for people of a special nature, there was an article in the Sunday Daily Camera "Focus" section recently which presented an interview with a gentleman in his nineties who had worked for a hardware store in Boulder during its days as a mining center. This type of person could be contacted, and a program developed around him for a course in Colorado or United States history. The program could cover a varied time segment, even extending to several class periods. It is a rare opportunity to be exposed to living history such as his. Unfortunately, due to the frailty of human life, this particular kind of individual could soon be lost to us. A tape presentation could be preserved almost indefinitely.
Complete instructional programming over the cable is not desired in the Boulder Valley Public Schools due to the dehumanizing effect mentioned earlier. However, here too, the diversity of the high school curriculum lends itself to experimentation and expansion. One possibility involving Russian language education was mentioned earlier. The concept presented in that example can be expanded to include a variety of courses that are offered in the larger schools, but not in the smaller, outlying schools because of insufficient demand. The television set can never take the place of the human instructor, but it can at least provide an opportunity where none existed previously.

Up to this point, only in-house production and programming have been examined. Looking outside of the Boulder Valley schools there are other programming sources available. One is the CSU-based HI-TIE program. This program is currently limited to two college-level courses (both aimed at computer techniques), but it does provide the advanced student the opportunity to earn college credit and learn what is becoming a basic skill in business and the sciences. CSU hopes to expand this program in the future with more diverse program content. As televised instruction and cable distribution become more common in the Denver-Boulder area there will exist the possibility for shared or traded programming, with
each system contributing its various specialties. While the "blue-sky" possibilities are covered later, it is conceivable to picture something along the lines of an educational cable network along the Front Range.

The final aspect of outside programming comes from Channel Six in Denver, the local PBS station. Because of the program schedule it would very likely be necessary to copy some programming for delayed cable-casting. If desired, Channel Six can be received "live" in the classroom through the regular cable facility and deactivating the converter. This "live" reception also applies to any of the commercial channels on the cable.

The production and scheduling of programming would be handled at the school studio near the community cable head end. As described earlier, this could be a joint effort with the cable operator. The actual studio facility would be very similar in nature and capability to that in Colorado Springs; a proven capability for handling three channels and the necessary production. However, it must be realized that the Colorado Springs facility serves a different function than this proposed Boulder studio. Colorado Springs produces programming with a small professional staff in two basic areas. The Boulder facility will produce programming of a very diverse nature. In addition, much of the programming; or performing if you prefer, in the Boulder facility will be
done by the current teaching staff, with the exception of outside speakers and programs such as HI-TIE. There will still exist the need for professional personnel in the areas of scheduling, production (including camera work and editing) and engineering.31 Hopefully, these professionals can also function as educators in the sense of dealing with and directing the activities of the students or interns of the Boulder Valley Vocational-Technical School. The training aspect of the studio is very important, not only in the obtaining of fifty percent of the yearly operational expenditure, but in decreasing the cost of operation also. Further opportunities exist for these students (outside of regular studio work) in the production of remote work such as concerts, interviews, and sporting events.

With the prospect of the year-round public school being seriously considered, along with the possibility of evening adult education, it is unlikely that there would be a large amount of studio time available for other production groups. However, if there were, rental agreements could be reached with the opportunity of additional revenue for the school's operation. Within the Boulder ordinance there is provision for the University of Colorado to utilize the three dedicated channels when the public schools are not using them. While current University plans do not call for this utilization at
present, personnel and programming trade-offs may be arranged in the future. One especially beneficial aspect of this would be not only the presentation of additional university-level courses to high school students, but for additional teacher education and in-service training.

Reception of the three Boulder Valley educational channels will be possible only with the use of a special converter, as long as all programming is cable-cast on the three dedicated mid-band channels. There is an economic benefit to be gained from wiring all schools in the district at the same time the Boulder community is being wired. However, the total expense of wiring all forty-seven schools at the same time may make this impossible, depending on available funding. If all of the schools cannot be wired, then following the phase plan, the high schools in the district should be wired first. At this point, a logistics problem must be resolved; should all of the classrooms be wired and mobile receivers be used, or should only a percentage of the learning areas be wired and fitted with permanent receivers? Two conditions determine this decision; first, with fixed receivers it would necessitate a great deal of student movement, and depending on the use of televised material, would make scheduling almost impossible. Second, there arises again the consideration of the cost
of wiring, either in stages, or at one time. The option of mobile receivers is probably the best. The exact number of receivers per school will have to be based on expected usage (mentioned in more detail below), but a safe estimate is a sufficient number of receivers so that in each school ten percent of the students, in groups of thirty, would have simultaneous access.

With the cable system covering the entire community there exists the possibility of education continuing beyond the walls of the school to deal with exceptional circumstances. If a student were hospitalized, or confined to his home, the schools can provide (to hospitals on a permanent basis) converters which will enable a student to continue with his school work. In Phase One this would consist of only that material which is cable-cast, but other possibilities might exist at a later date. The home-bound students' parent could pick up the converter at the school along with books and other materials. A deposit would insure the return of the converter. Other use of taped material can be made in the school library. While determination would have to be made by the teacher as to the necessity of the material, a taped presentation, particularly when it includes basic concepts, could be duplicated either in the main studio or in the library at a teacher's request. The duplication of this material would be on
video cassettes which can be checked out by students to study and review in special booths in the library. For the Phase One effort, one such booth in each school will be sufficient. This type of arrangement would also be beneficial to remedial efforts.

While it is obvious that the two high schools in Boulder will receive materials over the cable, other methods must be used for the present time for the other schools in the district. The most immediate and practical method is to use the regular school mails and bicycle programming, with each school having its own head end, or using tape play-back units in individual classrooms. The decision as to which method would depend on the extent of utilization of the service in each school. If a relatively high percentage of the teaching staff were to use this capability, the head end method would be the best; if there to be little use, the play-back units would be better. The actual number of students in the school are also a determining factor. As an example, the 133 students at Nederland High School would indicate that a play-back unit would be more efficient. The possibilities for "live" connection to the school's studio are discussed in a later phase.

Perhaps the single most important aspect determining the success of Phase One is education; education of the community and parents in exactly what
cable education is, and is not, and the education of the teachers who will be involved in both the production and reception of cable programming. Because of this, it is essential that the Boulder Valley Public Schools reach their decision concerning the adoption of cable long enough before its initial service to provide this education. It is imperative that teachers have sufficient time to do long-range planning of their particular curriculum, including materials to be covered, coordination with other teachers in their department, and decisions as to what material and how much might be suited for this system. While the Boulder Valley Schools are fortunate in that most teachers are eager to use this new tool, a program has to be developed to train them in its use and production, and its limitations. The exact nature of the initial system must be determined and an extended in-service program built around this. In order for the teachers to have sufficient time to develop these skills through in-service programs (rather than have to deal with summer schedules) it will be necessary to have a full school year of advance notice. Due to the construction time dictated by the cable operator, this is not a problem if the school decision is made within a reasonable time after the announcement by a cable operator that a Boulder system will be built. An additional gain from this planning would be the opportunity to work within the
studio before the school year begins in September. As long as the studio is completed before September, the teachers involved in the in-service program could have the opportunity to use the studio equipment, be trained in its operation, and hopefully be able to start production of materials for the upcoming year during the summer, if they are in the area.

If the schedule for the education of the teaching staff can be maintained as noted above, then this will aid greatly in the education of the community and the parents of students in particular. In the later stages of this parent education, it would be advantageous to be able to assemble a tape composed of program segments, and entire programs, to present to the community through the educational access channel (assuming the community cable is at that point operational), or at meetings of the Parent Teachers Association. Much earlier than this, though, would be the need to develop a community public information program, using every means available, including student take-home material, direct mailings, and news releases in local media. The necessary emphasis here is on informing the population that televised material is not going to replace the classroom teacher, and to emphasize the instructional aspect of the proposed programming. If parents and the general
public are made aware of this, it should eliminate most questions.

The exact cost of Phase One of this system is difficult to estimate because of the many variables involved including studio location, the extent of its use by the teaching staff (which also will determine the number of receivers) and equipment selected perhaps through bidding and compatibility with the cable operator's equipment. However, if the Colorado Springs system is used as a base, the studio facility and equipment, and the school wiring and receivers can be acquired for around $400,000, and a yearly operational budget of $100,000 is more than sufficient. This estimate is for a black-and-white-only capability; a color capability would add another $80,000 to the initial investment. 34

The most important aspect of Phase One is the evaluation of the system's effectiveness. The time span of Phase One has not been mentioned until now because up to this point it has not been a major concern. The evaluation of the system should be continuous, but at the end of Phase One it must be determined whether to go on, or to allow the current system to exist unchanged. Phase One must be long enough to allow for an accurate determination, or to phrase it more simply, to let the "new" wear off. It is possible within one year for there to be a great interest and use and then taper off, or,
the first year may create very little interest but then pick up in later years when the teaching staff develops more skill in the use of the medium and they see the success (and failures) of their peers. The suggested time for Phase One is three to five years. At the end of three years it may be readily evident as to which direction the system is headed and a stop or go decision can then be reached. If not, the time can be extended almost indefinitely, although this is the same as ceasing development.

The evaluation during this period must come from all concerned sources. The most immediate are the students themselves. While it would be very simple to compare television and non-television groups, this technique has proven to provide no significant results. The benefits of televised instructional and supplemental material must be judged according to separate standards such as quality of instruction, instructor time allotments and course diversity where none existed previously. The students can provide input based on their own experiences and attitudes towards televised material. This source is of particular importance due to the fact it is the goal of the output. Another evaluative source is the teachers involved in the system. They should be consulted as to that "seat-of-the-pants" impression that comes only with being in the same room with the students. This is an
evaluation that should not only be made at the end of the year, but should be a constant source of input, aimed at both the reception and production ends.

At the completion of the evaluation process, the decisions must be reached as to the next phase, or even if there is to be an additional phase.
PHASE TWO

If, at the conclusion of the evaluative process of Phase One, a positive decision is reached to continue the Boulder Valley Public Schools' cable education system, then it is time for expansion into Phase Two.

Phase Two is basically the same concept as Phase One, but now we are involving the junior high schools. The basic differences are that from the high school experience there will be a proven model from which to work, there will be existing studio facilities, and the problem of community education will be of a different nature, depending on the results and community acceptance of that program. The most important variation, though, is the effect on the system's capacity by more than doubling the number of students served. This, too, is dependent on the use of the available channel space by the high schools. Of course, initially, the only two high schools directly receiving programming on the cable are those in Boulder, so this may not present problems at this point. The main concern will be in studio space and time. An exact determination can only be made upon viewing results at the conclusion of Phase One.
In Phase Two, the same concerns of origination, delivery, and reception will be met as in Phase One. Again, this is dependent on the evaluation process and teacher response. It may be necessary to greatly alter the initiation process, but this is within the flexibility of this plan. In the area of delivery and reception, it will also be time to consider expansion of the existing system within the high schools. It may be desirable to expand upon the reception capability in all schools, or only in some. Of course, the possibility also exists of decreasing this ability in schools where the system is not being used to capacity, and trends do not indicate any change.

A major variation from Phase One will be the in-service training program of the junior high staffs. The school system will be able to draw on the training and experience of the high school faculty involved in televised production and use. It is also hoped that by this time there will be more teachers coming from the universities trained in visual production, and perhaps part of the trade-offs with the University of Colorado mentioned in Phase One could include courses or workshops in television use and production. Following a great series of "ifs," including interest, use, ability and job opportunity, consideration can be given to expansion of the vocational-technical training aspects of the
studio facility.

Within the junior high school curriculum there tends to be less variation of courses and course content. While students are presented with increased choice and opportunity, the core curriculum tends to be basic throughout the system. Because of this tendency, the programming becomes more simplified than in the high schools. With this simplification should come less individual teacher time directly involved with production, resulting in more time spent with individual students. This is especially important in the junior high schools because of the transition age of the students. In junior high most individuals make the leap from childhood to young adulthood; this is a difficult time for a person and with the important basic education delivered in these grades, it can become an almost impossible time for a young person to cope with. This reason alone is enough to warrant the time allotment required for individual attention. In addition to this is the consideration of the more extensive use of video cassettes in the school library. Besides the review of programming delivered in the classroom, it may prove advantageous to develop a series of cassette programs designed for special use outside the classroom for both the advanced student who is bored with the pace of the class, and the slower student who has difficulty keeping
up with the class. Of course, if this type of program is considered, there is no reason why it could not be extended to the high school programs.

This type of program development will cause variation in the cost of the system. If the remedial and advanced programs mentioned above were initiated, the cost would go up because it would require additional video play-back units in each school library. Currently, such units cost around $1,500, but with development and inflation both considered, by the time these opportunities were made available the cost could be greater, less, or remain the same. Similar conditions exist for all equipment.

An additional consideration, or reconsideration depending on action taken in Phase One, would be adult education within the community. At present, most adult education handled by the Boulder Valley Public Schools tends to be what is referred to as "hands on" types of classes such as art and woodworking. This kind of education could be expanded through the use of the cable in the community. By switching to an unused regular channel (discussed previously) this programming could be distributed to anyone on the cable, or for those not on the cable, provision could be made to allow viewing in a regular school classroom. Even in a "hands on" course there is a percentage of time that is instructional in a
lecture nature. The time spent in this manner that is
cable delivered will expand the time the laboratory is
available for use, thus expanding its actual use. Other
types of adult education can be solely cable delivered,
such as foreign languages.

With the addition of the junior high school
faculties and administrations, there will be even greater
capability for in-service operations. While new
applications of this may be considered, it is hoped that
at least current programs will be expanded. One possible
expansion, due to the increased reception capability,
would be school meetings involving the entire district.
With the construction portion of Phase Two completed,
there would be enough receivers for faculty members to
view a presentation without the amount of time and
distance covered as required by all teachers meeting
in a single building.

Again, as in Phase One, evaluation is a major
portion of the development of the system. Similar
techniques can be used to determine the effect of cable
education on the junior high student, faculty, and
administration, as were used in the Phase One evaluation.
At the same time, evaluation of Phase One (including any
additions made) should continue in order to avoid the
system becoming static. With the exception of new
equipment and utilizations, it may be possible to
decrease the extent of the evaluation in order to concentrate on the Phase Two initial evaluations.
PHASE THREE

Phase Three of this plan consists of the utilization of the cable and studio facilities by the elementary schools. This development closely follows that of the other two levels. Exceptions will include the type of programming (more supplemental than instructional) and processes and techniques learned and developed through the first two phases.

As in Phase Two, with construction in progress, consideration should be given to expansion of the other two levels, if the evaluations warrant it. Due to the fact that this will be the final major step in the building of the system, steps should be taken in evaluation and need determination concerning the adult education programs (assuming it has been developed previously).

Other possible areas of expansion requiring attention are the adult education program, the possible use of the channels as a school district information and public relations outlet, additional channel requirements, and a separate and/or expanded educational production and head end facility. This new production facility devoted entirely to the schools could be located near the current school headquarters, but would
require a microwave link to reach the community head end. This is necessary unless developments in the cable television industry make it possible to use cable over that distance for delivery to a head end without compromising picture quality. Of course, it is possible that the advantages seen now for the location of the educational head end near the district offices may no longer apply at the time this is considered.

In reference to the use of microwave transmission, advancements in this area may make this use feasible at that time. This would be advantageous not only for the educational head end, but also for the "live" interconnection of all of the schools in the district. This possibility alone would be reason to locate the head end near the school offices in order to use the ridge to the east for a central transmission point for microwave to Lafayette, Louisville and Broomfield. Nederland would require a two-hop system. Schools in Jamestown and Gold Hill will probably still have to use bicycled programming as their small enrollments would not justify the expense.

For the third time, as with Phases One and Two, evaluation is necessary. The same basic criteria and standards developed in One and Two must be utilized, along with the ongoing evaluations of the total system.
BLUE SKIES OVER THE ROCKIES

There has been a great amount of discussion in recent years concerning cable television and its "blue sky" possibilities. While the majority of this project is dedicated to utilization and techniques that are reasonable and dependable in 1974, there exist, nevertheless, uses of cable television which may become feasible and dependable in the next five to ten years. When the total time of the three phases described is combined we are discussing nine to fifteen years, or more. In that time these uses of cable may be seriously considered.

The first concern is that of two-way communication over the cable. If the microwave systems described before (although they too are "blue sky" now considering expense) were in use, it would be practical for the schools to be interconnected for two-way education. Classes such as the Russian language class could be conducted with students from four different schools all attending the same class without ever leaving their respective schools. The earlier mention of the hospitals and the home-bound student could also be improved by the use of a mobile camera and receiver in the student's classes; the student could be absent for almost any length of time and never
miss a class. With a two-way capability in every home in the community, the expansion of adult education would be limited only by community interest and the number of teachers available. One additional aspect of the two-way capability would be the transmission of school records and data, and copies with facsimile machines.

Other areas in "blue sky" made possible through simpler equipment and lower prices, would be each school building becoming a separately switched system with its own small production facility available not only to faculty, but also students for work in film production and video instruction. Other channel selections could include the school district's programming, those of the University of Colorado's, commercial stations, and the possible Colorado Front Range Educational Cable Network (including satellite presentations).

These are only some of the possibilities that cable and video development may bring. At present, these are the ones most often discussed. These developments are out of the school system's reach for now, but with the demand and expansion in the commercial cable industry, these may become available in the foreseeable future.
It is my feeling that the Boulder Valley Public Schools should institute an in-depth study of teacher attitudes toward cable (teachers at all grade levels), and their present capabilities in the use and production of visual materials. If the interest is felt to be adequate, a basic system should be designed and the exact costs determined. At the same time, efforts should be made to locate what funds are available locally within the school system, and to seek assistance from state and federal agencies.

When the exact economic status is determined, the design of the initial system, and to an extent future expansion, can be more precisely described. With this information at hand, work can begin on the educational programs for the involved teachers and the community. Simultaneously, negotiations should proceed with the cable operator and hardware suppliers for equipment and studio facilities.

It is important that this work be completed before the cable operator begins in earnest his own development; one of the biggest problems in the cable industry is a school or other public system demanding channels,
equipment and advice from an operator without any kind of plan as to what they intend to do with it. The cable operator is much more willing to lend what assistance he can if he can work with a solid, reasonable system proposal.40

While it has been suggested by the author that the high schools be the first schools accessed, studies by the schools may indicate a reordering of the three proposed phases. Even with this change, or any others such as the initial location of the educational studio, the same basic process of planning and evaluation should be retained.
FOOTNOTES

1 Interview with Noble Freden, Director of Instructional Media, Boulder Valley Public Schools.

2 Interview with Eugene Gullette, Assistant Superintendent, Boulder Valley Public Schools.

3 Interview with John Hoback, Principal, Boulder High School, Boulder Valley Public Schools.

4 Course lecture notes, College of Education, The Ohio State University, Columbus, Ohio.

5 Author's personal experience, Colorado State University, Fort Collins, Colorado, and The Ohio State University, Columbus, Ohio.


7 Author's experience of two years of junior high English instruction.

8 Interview with David Zeckser, Principal, Casey Junior High School, Boulder Valley Public Schools.

9 Interviews with John Hoback, Principal, Boulder High School, Keith Chambers, Principal, Fairview High School, and David Zeckser, Principal, Casey Junior High School, Boulder Valley Public Schools.


11 Interview with John Hoback, Principal, Boulder High School, Boulder Valley Public Schools.

12 Interview with Noble Freden, Director of Instructional Media, Boulder Valley Public Schools.

13 Ibid.
Interviews with John Hoback, Principal, Boulder High School, Noble Freden, Director of Instructional Media, Keith Chambers, Principal, Fairview High School, and David Zeckser, Principal, Casey Junior High School, Boulder Valley Public Schools.

Interview with Eugene Waldman, Television Supervisor, Colorado Springs Public Schools, District 11.

Interview with Keith Chambers, Principal, Fairview High School, Boulder Valley Public Schools.

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31 Interview with Eugene Waldman, Television Supervisor, Colorado Springs Public Schools, District 11.

32 Interviews with John Hoback, Principal, Boulder High School, and Keith Chambers, Principal, Fairview High School, Boulder Valley Public Schools.

33 Interview with S.S. Street & Associates.

34 Interview with Eugene Waldman, Television Supervisor, Colorado Springs Public Schools, District 11.


36 Ibid.

37 Author's experience of two years of junior high English instruction.

38 Interview with Keith Chambers, Principal, Fairview High School, Boulder Valley Public Schools.

39 Refer to Appendix 1.

40 Interview with Tom McQuire, Cox Cable Communications, Inc., Atlanta, Georgia.
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Freden, Noble, Director of Institutional Media, Boulder Valley Public Schools, Boulder, Colorado.

Gullette, Eugene, Assistant Superintendent, Boulder Valley Public Schools, Boulder, Colorado.

Heckle, Jim, Boulder Public Library, Boulder, Colorado.

Hoback, John, Principal, Boulder High School, Boulder, Colorado.

Lancaster, Stan, Principal, Boulder Valley Vocational-Technical School, Boulder, Colorado.

Lipton, Edward, Legal Aid Society, Colorado State Prison, Canon City, Colorado.

Mayheu, Thomas X., Southwest Regional Center for Community School Development, Arizona State University, Tempe, Arizona.

McGuire, Tom, Coordinator, Local Origination, Cox Cable Communications, Atlanta, Georgia.

Street, Sam, and Nancy Street, S.S. Street and Associates, Boulder, Colorado.

Tracey, Steve, Learning Resources Director, Boulder Valley Vocational-Technical School, Boulder, Colorado.


Zeckser, David, Principal, Casey Junior High School, Boulder, Colorado.
OTHER INFORMATION SOURCES AND MATERIALS

Boulder Valley Public Schools, District RE2-Fact Sheet.

Catelevision - Newsletter on Cable Television in Ohio, Mershon Center, Ohio State University.

Department of Education, San Diego County, California; and Missio Cable TV, Inc., El Cajon, California.

Enix, Philip, Presentation in Cable Television class, EE597, University of Colorado, Spring semester, 1974. Title: The Role of Cable Television in Education.


Programming Schedules, Colorado Springs Public Schools, District 11.

Proposal for a Cable Communications System to Serve the City of Boulder, Teleprompter Corporation.


Statement by Dr. James G. Miller, President, University of Louisville, 1973.

Survey of Two-Way Cable Television Testbeds, Cable Television Information Center.
APPENDIX
APPENDIX ONE -- FUNDING SOURCES

The following are some of the potential sources of federal funding for programming on the Boulder Valley Public Schools educational cable channels. The source is the Teleprompter Proposal, and the 1972 Catalog of Federal Domestic Assistance.
## APPENDIX ONE -- FUNDING SOURCES

### Adult Education -- Special Projects
Funds: Match 10% of project costs.  
$23,000 to $338,000.

### Drug Abuse Prevention
Funds: Based on population.  
$10,000 to $300,000.

### Vocational Education -- Basic Grants
Funds: 50/50 matching  
$82,768 to $30,091,972.

### Educational Personnel Department -- Media Specialists
Funds: $20,000 to $150,000.

### Educational Dissemination
Funds: Match 5% (minimum)  
$8,500 to $650,000.
$13,521  Experimental Schools  
Office of Education, Department of  
Health, Education and Welfare  

Project Grants  
Funds:  $10,000 to $30,000  

$45,006  Promotion of the Arts -- Public Media  
National Endowment for the Arts,  
National Foundation on the Arts and  
Humanities  

Project Grants  
Funds:  $3,750 to $45,500  

$45,104  Promotion of the Humanities -- Public  
Programs  
National Endowment for the Humanities,  
National Foundation on the Arts and  
Humanities  

Project Grants  
Funds:  $3,000 to $2,000,000
APPENDIX TWO -- BOULDER VALLEY PUBLIC SCHOOLS ENROLLMENT AND DISTRIBUTION
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<th>5/10/73</th>
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<td>208</td>
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<td>AURORA 7</td>
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<td>586</td>
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<td>BEAR CREEK</td>
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<td>599</td>
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<tr>
<td>BURKE</td>
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<td>344</td>
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<tr>
<td>COLUMBINE</td>
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<td>713</td>
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<tr>
<td>CREST VIEW</td>
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<td>723</td>
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<td>DOUGLASS</td>
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<td>486</td>
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<td>EISENHOWER</td>
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<td>713</td>
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<td>EMERALD</td>
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<td>JAMESTOWN</td>
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<td>551</td>
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<td>224</td>
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<td><strong>TOTAL</strong></td>
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<td></td>
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<td><strong>ELEMENTARY</strong></td>
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<td><strong>TOTAL</strong></td>
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<td><strong>MIDDLE SCHOOL</strong></td>
<td>769</td>
<td>761</td>
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<td>School</td>
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<td>5/10/73</td>
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<td>--------</td>
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<tr>
<td>BASE LINE</td>
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<td>612</td>
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<td>832</td>
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<td>BURBANK</td>
<td>639</td>
<td>652</td>
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<td>CASEY</td>
<td>605</td>
<td>597</td>
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<td>CENTENNIAL</td>
<td>680</td>
<td>651</td>
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<td>NEDERLAND JUNIOR-SR.</td>
<td>258</td>
<td>149</td>
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<td>NEVIN PLATT</td>
<td>975</td>
<td>908</td>
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<td>SOUTHERN HILLS</td>
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<td>706</td>
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<td></td>
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<td>BOULDER</td>
<td>1,664</td>
<td>1,729</td>
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<td>BROOMFIELD</td>
<td>791</td>
<td>727</td>
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<td>CENTAURUS</td>
<td>676</td>
<td>700</td>
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<td>FAIRVIEW</td>
<td>1,949</td>
<td>1,827</td>
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<tr>
<td>NEDERLAND</td>
<td></td>
<td>133</td>
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<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>SENIOR HIGH</strong></td>
<td>5,080</td>
<td>5,116</td>
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<td><strong>TOTALS</strong></td>
<td>23,142</td>
<td>23,328</td>
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APPENDIX THREE -- COURSE EXPANSION

The following chart presents twenty courses which are offered in the Boulder Valley Public School district, but which are not offered in all five high schools. While there are far more than twenty courses which are not offered in all five schools, these provide a representative sample of the course expansion possible through televised instruction.

The given enrollment figures are for the 1974-75 school year, and individual course enrollments are from the individual school's spring pre-registration. The course titles and numbers are from the school's course catalogs.

On the chart, where the per school course enrollment is given, those with an indicated percentage are the school or schools offering the course currently; this percentage is that of the enrolled students compared to the total school population. The percentage is then applied to the school population of schools not offering the course and the resulting number of students is then given under that particular school. In cases where more
than one school is currently offering the course, all percentages are given, and an average percentage is applied to the remaining schools.

All stated and derived enrollment figures are for one semester only. For an entire year (assuming two semesters) the numbers would be doubled.

Assuming regular in-school classes are limited to a minimum of twelve students and a maximum of twenty-five, then the courses examined would account for an additional 77 classroom teacher hours, per semester. With a teacher load of five classes per day, these additional offerings would require 15.4 new teachers in the school system.

The average teacher salary per year in the Boulder Valley Public Schools, in 1974, was $11,429. The 15.4 new teachers required would cost the schools, for one semester, $88,003 in additional salaries. This figure does not include any consideration of students in schools where the minimum of twelve interested students is not met; they would not be served. However, these students would be served by televised instruction, even if there was only one interested student in the school.

This is based on the assumption that the Boulder Valley Public Schools are concerned with providing equal educational opportunity for all students in the district.
With the twenty described courses only, the cost of the required additional faculty for one year (salaries only) is $176,000. The cost of the described initial system is $400,000, plus $50,000 per year in operating cost, assuming the State Board for Community Colleges and Occupational Education will absorb 50% of the yearly operational budget.

From these conditions can be concluded that the cost of the televised instruction for four years is $600,000, including both the cost of the system spread over the four years, and the operational budget. To teach the same courses with classroom teachers, as described, would cost $704,000. This should be considered with the expected life of studio equipment and receivers as being ten years. The expanded opportunity and the money saved through television instruction should be obvious.

If the three dedicated channels were fully utilized, seven classes per day in all five high schools, this would amount to the equivalent of 105 teacher hours per day. To match this with personnel in each school (each teacher with five classes per day) would require 21 additional teachers, at a cost of $240,000 per year in salaries alone.
### Chart of Twenty Possible Course Expansions Through Televised Instruction and Cable Delivery

<table>
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<tr>
<th>Name of School</th>
<th>1974 Enrollment</th>
<th>Total New Students Per Course</th>
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<tbody>
<tr>
<td>Boulder High School</td>
<td>1664</td>
<td>3</td>
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<tr>
<td>Fairview High School</td>
<td>1949</td>
<td>21</td>
</tr>
<tr>
<td>Centarus High School</td>
<td>676</td>
<td>64</td>
</tr>
<tr>
<td>Broomfield High School</td>
<td>791</td>
<td>191</td>
</tr>
<tr>
<td>Nederland High School</td>
<td>133</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
<th>Boulder High School</th>
<th>Fairview High School</th>
<th>Centarus High School</th>
<th>Broomfield High School</th>
<th>Nederland High School</th>
<th>Total New Students Per Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-22</td>
<td>Stenoscript ABC Shorthand</td>
<td>2.5%</td>
<td>2.3%</td>
<td>2.0%</td>
<td>14</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>42</td>
<td>45</td>
<td>14</td>
<td>18</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>B-41</td>
<td>Intro Business Organization</td>
<td>5.4%</td>
<td>2.5%</td>
<td>2.3%</td>
<td>91</td>
<td>91</td>
<td>64</td>
</tr>
<tr>
<td>B-42</td>
<td>Personal Business</td>
<td>5.4%</td>
<td>1.3%</td>
<td>2.3%</td>
<td>91</td>
<td>105</td>
<td>191</td>
</tr>
<tr>
<td>B-46</td>
<td>Business Communications</td>
<td>.8%</td>
<td>1.3%</td>
<td>2.3%</td>
<td>14</td>
<td>26</td>
<td>12</td>
</tr>
<tr>
<td>B-62</td>
<td>Human Relations in Business</td>
<td>33</td>
<td>39</td>
<td>2.0%</td>
<td>33</td>
<td>39</td>
<td>91</td>
</tr>
<tr>
<td>B-75</td>
<td>Advertising and Display</td>
<td>47</td>
<td>55</td>
<td>2.8%</td>
<td>47</td>
<td>55</td>
<td>128</td>
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<tr>
<td>E-32</td>
<td>Library Science</td>
<td>23</td>
<td>1.4%</td>
<td>1.4%</td>
<td>27</td>
<td>27</td>
<td>46</td>
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<tr>
<td>E-82</td>
<td>Black Literature</td>
<td>37</td>
<td>2.2%</td>
<td>2.2%</td>
<td>43</td>
<td>43</td>
<td>72</td>
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<tr>
<td>F-71</td>
<td>Russian I</td>
<td>80</td>
<td>4.8%</td>
<td>4.8%</td>
<td>94</td>
<td>94</td>
<td>156</td>
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<tr>
<td>F-72</td>
<td>Russian II</td>
<td>37</td>
<td>2.2%</td>
<td>2.2%</td>
<td>43</td>
<td>43</td>
<td>72</td>
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</tbody>
</table>

**Note:** The chart lists various course expansions and their enrollment numbers for 1974, along with the total new students per course for each school.
<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
<th>Boulder High School</th>
<th>Fairview High School</th>
<th>Centaurus High School</th>
<th>Broomfield High School</th>
<th>Nederland High School</th>
<th>Total New Students Per Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>K6Q</td>
<td>Consumer Math</td>
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<td>2.7% 54</td>
<td>18</td>
<td>21</td>
<td>4</td>
<td>88</td>
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<tr>
<td>K7D</td>
<td>Computer Science</td>
<td>1.4% 24</td>
<td>27</td>
<td>9</td>
<td>11</td>
<td>2</td>
<td>49</td>
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<tr>
<td>R-33</td>
<td>Greenhouse</td>
<td>110</td>
<td>129</td>
<td>6.6% 45</td>
<td>59</td>
<td>9</td>
<td>300</td>
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<td>R-51</td>
<td>Advanced Chemistry</td>
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<td>7</td>
<td>8</td>
<td>1</td>
<td>36</td>
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<tr>
<td>R-55</td>
<td>Qual. and Quan. Analysis</td>
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<td>2.3% 46</td>
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<td>19</td>
<td>3</td>
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<td>United States Minorities</td>
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<td>4.0% 78</td>
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<td>24</td>
<td>4</td>
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<td>1.4% 10</td>
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<td>10</td>
<td>2</td>
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<td>27</td>
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<td>2</td>
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<td>22</td>
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**TOTAL: NEW STUDENTS SERVED** 1768