CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

AN INVESTIGATION OF THE FEASIBILITY OF A
CLOSED-CIRCUIT TELEVISION SYSTEM AT
CHIENGMAI UNIVERSITY, THAILAND

A thesis submitted in partial satisfaction of the
requirements for the degree of Master of Arts in
Secondary Education

by

Penporn Katchard

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The thesis of Penporn Katchard is approved:

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To My Parents For

Their Love
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ABSTRACT

AN INVESTIGATION OF THE FEASIBILITY OF A CLOSED-CIRCUIT TELEVISION SYSTEM AT CHIENGMAI UNIVERSITY, THAILAND

by

Penporn Katchard

Master of Arts in Secondary Education

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Educators in Thailand urgently require skilled manpower for national development so the vast body of students may be trained rapidly in a limited number of educational institutions and by a limited number of qualified teachers. A closed-circuit television is hoped to be one implement that could be used to solve this problem. Studies have proved its effectiveness and its worth as an educational tool. Television is not necessarily as expensive and complicated a medium as is generally thought. It can be adapted, with simple equipment and at a relatively low running cost. It is possible to establish a closed-circuit television at Chiangmai University, Thailand.

The process employed in an investigation of the feasibility of a closed-circuit television was as follows:
(1) Selecting concepts related to content areas.
(2) Consideration, whether or not television has proved valuable for other institutions of higher education and
(3) Investigating the procedure of some schools that are utilizing television in regular education program.
(4) Points of view of a closed-circuit television.
(5) The proposed plan for establishing a closed-circuit television at Chiangmai University, Thailand.
CHAPTER I

INTRODUCTION

In 1963, a United Nations study was undertaken to determine a rational plan for Thailand's economic development. The results of the study indicated that there was a severe shortage of qualified people in many fields. Especially lacking was the properly trained manpower essential to the structure of a modern economy. Clearly, Thailand's system of higher education was faced with a challenge.

Colleges and universities in Thailand are state controlled and financed. There are nine degree-granting universities, seven degree-granting colleges of education and five associate degree-granting private colleges in a nation of 38 million people. The problem is well illustrated by the fact that the number of high school graduates who apply for college are increasing every year. Over crowding dictates that only 35 percent of all qualified applicants can be accepted. Not only is there a lack of classrooms and instructors, many archaic and inefficient practices hamper education.

Whether-or-not Thailand can successfully expand and improve the system of higher education remains to be seen. However, without the necessary reforms, the
colleges and universities cannot adequately aid the process of rapid and sound economic development. New techniques of instruction are desperately needed.

In this report, I will explore the feasibility of utilizing a closed-circuit television that could greatly improve the quality and efficiency of higher education in Thailand.

Background of the Problem

Chiengmai University was established at Chiengmai, located in the northern part of Thailand, in order to answer the growing demand for university education in that part of the country. Students enrolled at this university come from all parts of Thailand but most are students from Chiengmai. All students speak the Thai language, some students can speak other languages, for example, Lao, Chinese or Malay. However, these languages are used with their families only.

Chiengmai University opened in 1964 with an enrollment of 291 students. Four-year courses are offered in 5 faculties: Agriculture, Medicine, Engineering, Accounting, Public Administration and Commerce. The fields of Art, Humanity and Education were later added to the curriculum. In 1972 enrollment totaled 5,679 students 464 instructors, 175 part-time instructors and another 1,720 supporting personnel. The purpose of this university is to produce students high in productivity
and efficiency. Chiengmai University is faced with a shortage of instructors so the ratio between instructors and students is high. This shortage of instructors is the most crucial problem that may prevent this university from reaching its goals of producing students of a high caliber. Fortunately, the need for a solution to this problem occurs at a time when radio, television, and film media have come on the scene. Since closed-circuit television has been proven effective in educational circles in the United States, the author expects that in the near future the university will investigate this device.

Statement of the Problem

The purpose of this study was to investigate the feasibility of establishing a closed-circuit television system at Chiengmai University. The process employed included an investigation based on a review of the literature concerned with the effectiveness of, the advantages of, the problems of, and the attitude of students and the faculty towards a closed-circuit television system, and a survey of recent literature pertaining to the school use of TV including a visit to a school using television.

Limitations of the Study

In this study, the author investigated some previous studies, the effectiveness, advantages, problems,
and attitudes involved in the use of television. A survey of the literature, a visit to a school utilizing television, its success or failure, and a consideration of this particular university's possible involvement with a closed-circuit system. The study concludes with a chapter of conclusions and recommendations which are pertinent to the Chiangmai University situation.

**Definition of Terms**

**Closed-circuit Television.** Closed-circuit television or CCTV, refers to the type of television which transmits signals via cable.

**Coaxial Cable.** A conductor centered inside of and insulated from a cylinder which is also used as a conductor. The two conductors are separated by a dielectric.

**Talk-back.** A voice intercommunicator, an intercom.

**Amplifier.** An electrical device through which the sound or picture signal is strengthened.
The Concepts

There are two different concepts concerning the use of television in education. These concepts have brought about two frequently used terms; educational television, and instructional television.

Educational Television (ETV)

The term "educational television" is generally applied to non-commercial television. However, in the United States, ETV is sometimes used, more narrowly, to describe cultural and educational programs for at-home viewers. (22) ETV is often interpreted as meaning any use of TV for educational courses offered to any group, either with or without academic credit. The courses may be broadcast via commercial or educational stations or closed-circuit television. (6)

In the United Kingdom, educational television is applied to embrace all use of television, both supplementing and enriching the teacher's work in the classroom including direct teaching. The programs are broadcast via both the B.B.C. and the Independent Television Authority (I.T.A.), mainly on open circuit. In
supplementing and enriching the teacher's work, ETV is found to be a valuable means of introducing complex ideas and experiences ranging far beyond the immediate everyday experience of the youth who watch it. The wide range of television programs includes science, engineering, mathematics, French, German, current affairs, simple economic, sociology, drama, and careers. (9)

In direct teaching, television has also been more extensively used by both the B.B.C. and the I.T.A. For example, a successful experiment has been tried out by the B.B.C. in the use of a television screen to help groups of young children who were finding difficulties in learning to read. It is increasingly being shown in practice that television in such fields as reading, mathematics, music and sciences can assist the teacher effectively in his most basic tasks. (9:3) In this sense, the British usage of the term "Educational Television" also covers the American usage of "Instructional Television."

**Instructional Television (ITV)**

In contrast to educational television, ITV is a term used to describe formal school, college or university instruction via television. (22)

Many studies highly exaggerate the use of instructional television. Siepmann (27) said television is not a panacea for all educational ills, nor is it an
alibi for teaching. He stated:

"... More importantly, television is not just one thing to be used for one purpose only. Its uses are multiple, depending on:

(1) the need and circumstances of a given school system, and

(2) the inherent characteristics of the medium." (27:12)

Instructional television, since the 1940's, has been developed through the support of various foundations such as the Ford Foundation's Fund for Adult Education and the Fund for the Advancement of Education, spending more than $100 million. The Federal Government's support has added approximately the same amount in equipment to the nation's educational television facilities. It is evident that, for instructional television to get where it is, it took the combined and enthusiastic efforts from various fields and disciplines, including veterans of educational film and radio, communication specialists in universities, foundation executives, workers in adult education, private citizens concerned with the quality of education, school superintendents, creative professors and teachers, and fugitives from commercial television. The primary objectives of those efforts on Instructional Television are first, to put educational programs, on commercial
stations; later to stimulate in-school programs, both by broadcast and closed-circuit television; then to establish, equip and staff non-commercial television stations to provide evening and out-of-school programs. (22:11)

Historical Development of Educational Television

Although the history of educational and instructional television is short in years, its progress has been rapid. The military services pioneered in experimenting with television for instructional purposes. The experiments were supported by the Ford Foundation, the Carnegie Foundation, and funds from the Federal Government encouraging the development of educational television in colleges and universities. (21)

In 1932, the State University of Iowa was the first institute to have experimented with teaching via television on W9XK which transmitted more than 400 programs during 1932 to 1939. The programs included such courses as art, shorthand, engineering and botany. (1:77)

In 1948 several other universities, including the University of Michigan and American University in Washington, D.C., produced educational programs for broadcasting over commercial transmitters. Michigan State's programs were designed for adult audiences. (22:21)

In 1949, in-school telecasting on a regular basis began in the Philadelphia public schools on commercial stations. (24)
In February 1950, WOI-TV at Iowa State College began regular program operations as a commercial station and became the first non-experimental, educationally owned TV station in the United States. (24:23)

In 1951 Western Reserve University began producing courses for university credit over the commercial station in Cleveland. (24)

In 1953, the first educational television station to go on the air was KUHT in Houston, Texas. (24)

In 1956 the Chicago Board of Education launched the Chicago City Junior College experiment, offering on television a complete junior college course leading to the degree of associate in arts. Partially financed by a grant from the Fund for the Advancement of Education during its first three years, this program has passed its experimental period and is entering its second year as a permanent operation. (6)

One of the most successful educational television efforts utilizing CCTV system is that of Hagerstown, Washington County, Maryland. The experiment began in 1956, subsidized by the Electronics Industries Association and the Fund for the Advancement of Education. The project was ended in 1961, but television had proved itself so valuable that the county has continued and expanded its use as an integral part of the instructional program, linking forty-five schools
to the Hagerstown Studios, which can send out six lessons simultaneously by cable to more than 800 television sets throughout the county. (22:53)

In 1957, when the Fund for the Advancement of Education initiated the National Program in the Use of Television in the Public schools, eleven cities and three states participated in a study of teaching large classes by television.

The Midwest Programs on Airborne Television Instruction, also supported by the Ford Foundation, was initiated in 1961 with a variation on the network idea. Transmitting over two channels from a DC-6 aircraft circling four miles above the small town of Montpelier, Indiana, the MPATI could be received over a radius of 150 to 200 miles in all directions, reaching parts of six stages. The MPATI put in a full day's schedule of programs with many excellent instructional series on tapes.

The Effectiveness of TV Instruction

Hagerstown was the first school system to use closed-circuit television. It desired to offer better work in art and music, subjects in which many of the teachers had no special competence. In the rapidly advancing area of science, many teachers, especially in the elementary grades, were not equipped to teach modern up-to-date courses. Television could help to share
excellent teaching of music, art, and science throughout the system. Television also might contribute to in-service training.

Many research comparisons have been made between television and conventional instruction. The vast studies of television research are concerned with effectiveness, attitude or acceptance, disadvantages and advantages.

The university of Houston Psychologists, Evans, Roney and McAdams (10) studied the effectiveness of an elementary psychology and an elementary biology course on KUHT-TV, the educational television station. The experimenters found no significant differences in the average scores of the groups, the conclusion being that television lecture was just as effective as a face to face classroom lecture.

Martin (20) reported on the study of the effectiveness on dramatic appreciation of the play OUR TOWN by Thornton Wilder. The study was concerned with two groups of 94 high school students each being paired on the basis of age, sex, intelligence, and reading ability. One group was taught dramatic appreciation by reading the play and discussing it with their teacher in a face-to-face situation as written dramatic literature. The other group was taught the same written dramatic appreciation, but also saw several scenes from
the play dramatized as part of a TV method of instruction. Student achievement was evaluated by administering a 91-item questionnaire to both groups. The result was:

(1) Students taught by TV dramatization did significantly better than students taught by face-to-face methods of instruction.

(2) There was no significant difference between methods of instruction for recall of scenes not dramatized.

(3) Students who were taught by televised dramatizations had significantly different appreciation of the play than did students taught face-to-face.

(4) Students taught by TV tended to choose dramatized scenes to illustrate as answers to essay questions more often than students taught face-to-face.

Kansas City (MO.) Public Schools (16) studied the effectiveness of television on 12,000 students in History, Spanish, science, citizenship, and reported that there were significant differences from TV and face-to-face instruction for the class in history. TV was discovered to be superior in face-to-face instruction of Spanish and science. Citizenship classes had trouble accepting televised instruction and therefore responded
Anderson and VanderMeer (2) reported the results of a study of the comparative effectiveness of television and face-to-face teaching. Five classes of 105 high school sophomore students were taught operation of a slide rule by television and face-to-face methods of instruction. Three classes were taught in their regular classrooms via television. The other two classes were taught the same material by the same teacher the TV group had. They concluded that TV as equally effective, as face-to-face means of instruction in teaching slide rule operation.

Gordon (12) stated that TV teaching of remedial speech by a trained speech correctionist produces significantly more improvement in articulation than face-to-face teaching of remedial speech by the regular classroom teacher. After he studied about the effectiveness of TV in presenting remedial speech training to improve articulation of sound, a total of 169 students in 20 Hawaiian schools was separated into two groups, 87 students with articulation problems in nine experimental groups were taught remedial speech by television. In nine control groups 82 students with the same articulation problems were taught remedial speech by their regular classroom teacher.

Attitude toward TV Instruction
Handleman (13) reported on a study comparing the attitudes of two groups of college teachers toward teaching by closed-circuit television. Ten questionnaires were sent to each of 40 colleges and universities utilizing closed-circuit television. The questionnaires were sent to the television coordinator of each school with directions for distribution and matching. From questionnaires returned from 24 schools, Handleman indicated that teachers who had taught by television had a significantly more favorable attitude toward ITV than had teachers who had not taught by television.

Beatts (3) reported on the use of closed-circuit televisions in teaching the subject of IBM machine to customer-engineering students. It was concluded that teachers and students became increasingly more favorable to instructional television, and that the deduction in the class time spent was feasible.

DeViney (8) studied about pupil-teacher attitudes toward closed-circuit television observation dealing with Elementary education course, using as an instrument the Minnesota Teacher Attitude Inventory (MTAI). The conclusion was that attitude test scores did not differ significantly between students who had had no television observations and television students. Of these television students 70 percent indicated they would voluntarily register for another ITV course.
Hagerstown: In this study, the Board of Education (14) reported students'-teachers' attitude to ITV. A total of 2,567 students in grade 3 through grade 12 were chosen as random and given an anonymous 50-item questionnaire about their feelings toward ITV. The students accepted ITV. Only 5 percent indicated they never had their questions answered; 87 percent indicated that the follow up discussion was of great benefit. Fifty-eight percent of the students thought they learned more from ITV than from face-to-face presentations. Two-thirds of the students thought that an ITV course would be more interesting and that they would have to pay closer attention in a television classroom. Sixty percent indicated that they studied more for ITV classes. Teachers responded favorably to ITV in an anonymous questionnaire; 83 percent indicated they would prefer to teach their present class with ITV, and thought ITV could improve the quality of instruction. Scores on standardized tests of ITV students in various grades tended to be greater than scores from face-to-face students in the same grade.

Souder and others (30) studied the effectiveness of and students' attitude toward a physical education course utilizing TV and face-to-face instruction for freshman and sophomore college students. The conclusion was there is no significant difference between
methods of TV instruction and face-to-face instruction, as they affect attitudes toward physical education.

Disadvantages and Advantages of Instructional Television

Disadvantages

Herminghaus (15) reported on the study of an investigation of television teaching on General science & English composition to 1,000 ninth-grade students. Students, on the whole, did not react favorably to TV teaching as evidenced by attitude inventory conducted near the end of the experiment. Two-thirds of the English students and half of the science students taught by TV thought they would have learned more in the face-to-face situation. They also reported they felt the TV instruction was less interesting and they missed personal contact with the teacher. The author concluded that students, by the ninth grade, have come to expect face-to-face contact with a teacher in the instructional situation and felt insecure in the TV teaching situation.

King (18) studied the relative effectiveness of the learning by face-to-face and television of a course in remedial mathematics by college students. The author reported that television students thought the class was more poorly organized than did the face-to-face students and that their chance of participation was less than the face-to-face students.

Seibert (26) reported on a brief report and
evaluation of closed-circuit television in Mechanical Engineering. He cited that: Unfavorable responses included inability to ask questions (Although a talkback system was available), lack of opportunity to take notes in class and lack of opportunity to know the teacher.

Advantages

Purdue University (23) stated that students in bacteriology felt they learned more, felt the course was more interesting, that television permitted closer viewing, had a greater variety of demonstrations, and that television enabled them to pay attention and learn more easily. They disliked sitting on a lab stool, the glare from the glassware & the small screen.

Silagyi (25) reported the results of study where 2,840 pupils in eight Detroit schools took an attitude questionnaire in a course of third-grade French, fourth-grade Spanish, fifth-grade Spanish, science and health. Pupils indicated that it was easy to learn by television, that they did not become restless during a televised lesson, and that they had to listen more carefully to a television teacher than one in the classroom. They reported that their neighbors did not bother them any more in their TV classes than in their face-to-face classes. Pupils felt that they were learning as much on TV as they would in a face-to-face situation. They felt TV helped to make the lessons more understandable
and that television helped them see more clearly.

The Pennsylvania State University Experiment

A general basis is statistically presented in a Pennsylvania State University report. The report covers the second and third academic years, 1955-1956 and 1956-1957, of the Penn State television project. The central theme of the report is television in relation to the improvement of teaching techniques and practices, the problem with which this paper deals. In 1954, Penn State incorporated into its plans a large and extensive closed-circuit television system of the type later to be described. From 1955 to 1957, 113 courses were aired via this means. In attempting to evaluate its program, the University defined four general problem areas of research:

(1) effectiveness,
(2) acceptability,
(3) appropriateness, and
(4) feasibility.

All four criteria must be fulfilled. The results of the experiment, moreover, were not only sought to prove television for Penn State, but also to act as a guide for other institutions. Numerous tests were constructed and evaluated, and many charts were made to assess the success or failure of the program.

Table 1 presents some partial results relative
to the first category of effectiveness. It illustrates that while in some cases the mean test scores of the students was higher when they received television instruction, in other samples it was lower. What this table provides is an answer to one group of scoffers: educational television is not such a passive medium that it causes lower scholastic achievement. In many cases it seems to provide clearer and more definite information for the student. Students in the sciences, for example, seemed to profit more from television teaching than they did under the lecture system alone.

Table 2 illustrates that there is no statistical significance in courses of various sizes when taught under a television system. The medium, hence, allows for larger classes without causing a corresponding deterioration in the quality of academic performance. These two examples, then, illustrate the fact that television is effective when used as an educational tool.

Under the heading of appropriateness, Penn State sought to determine whether television was an appropriate medium for certain presentations and courses. Over the five semesters of televised work, the number of courses taught increased from three to eighteen; they ranged from the sciences and engineering through the general liberal art courses to such specifics as
<table>
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<th>Course</th>
<th>Students</th>
<th>Exam Average for TV</th>
<th>Exam Average for Direct</th>
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<tr>
<td>General Psychology</td>
<td>63</td>
<td>24</td>
<td>86.17</td>
</tr>
<tr>
<td>General Chemistry</td>
<td>153</td>
<td>159</td>
<td>83.60</td>
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<tr>
<td>Elementary Bus. Law</td>
<td>45</td>
<td>42</td>
<td>78.27</td>
</tr>
<tr>
<td>Intro. Sociology</td>
<td>140</td>
<td>139</td>
<td>47.15</td>
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<td>Elementary Meteorology</td>
<td>53</td>
<td>55</td>
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<td>Music Appreciation</td>
<td>43</td>
<td>31</td>
<td>84.57</td>
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<td>Elementary Bus. Law (2)</td>
<td>42</td>
<td>47</td>
<td>72.79</td>
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<tr>
<td>Intro. Sociology (2)</td>
<td>132</td>
<td>138</td>
<td>48.06</td>
</tr>
</tbody>
</table>

* The reader may note that in four areas the non-TV group scored slightly higher. This may be due to extraneous factors such as age, sex, background of the student and/or the small number of students included in the sample.
TABLE 2

SUMMARY OF RESULTS FOR VARIED CLASS SIZE IN EXAMINATIONS ON CHEMISTRY AND PSYCHOLOGY, IN AIR SCIENCE AND ECONOMICS

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<th>Class Size</th>
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<td>44</td>
<td>77.97</td>
<td>119</td>
<td>36.82</td>
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<td>32</td>
<td>76.26</td>
<td>49</td>
<td>36.41</td>
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<td>22</td>
<td>66.29</td>
<td>46</td>
<td>35.57</td>
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<tr>
<td>21</td>
<td>74.00</td>
<td>35</td>
<td>36.26</td>
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<td>11</td>
<td>68.56</td>
<td>21</td>
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<table>
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<th>Class Size</th>
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<td>27.38</td>
<td>41</td>
<td>144.85</td>
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<td>43</td>
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</table>

(4:20-21)
music appreciation and advanced radio drama. Some of the courses were totally televised, while others were presented only in part on television. Various methods of presentation were used: in some courses notes were provided, and some courses utilized graphic and pictorial demonstration materials. Tests were also varied in nature. Whereas adequate quantitative materials for determining the degree of appropriateness were not at hand, the Penn Study concluded, on the basis of experience and judgement, that television is appropriate for many educational functions. It was also determined that by adapting courses and by classifying them according to subject matter and demand, the appropriateness factor can be improved.

Pennsylvania State University was also interested with the acceptance of television as a valid educational tool.

Table 3 presents the faculty preferences for television or direct instruction. It will be noticed that when the program was instituted, a minority of professors were in favor of it. But by the second year, instructors who had taught over television were seventy-four per cent in favor of it. Experience with the medium evidently taught them its value.

Table 4 manifests that students themselves seemed to prefer televised courses once they had experienced
### TABLE 3

**FACULTY PREFERENCES FOR TELEVISION OR DIRECT INSTRUCTION IN LARGE CLASSES**

<table>
<thead>
<tr>
<th>Response</th>
<th>1955-1956</th>
<th>1956-1957</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non - TV Teachers (N = 177)</td>
<td>Non - TV Teachers (N = 140)</td>
</tr>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Television</td>
<td>28</td>
<td>34</td>
</tr>
<tr>
<td>Large Class</td>
<td>37</td>
<td>41</td>
</tr>
<tr>
<td>No Difference</td>
<td>27</td>
<td>17</td>
</tr>
<tr>
<td>No Answer</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Misc. Comment</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Don't Know</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Faculty Opinions of Quality of TV Instruction in Comparison with Direct Instruction**

<table>
<thead>
<tr>
<th></th>
<th>1955-1956</th>
<th>1956-1957</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV Better</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td>TV Same</td>
<td>33</td>
<td>38</td>
</tr>
<tr>
<td>TV Worse</td>
<td>52</td>
<td>38</td>
</tr>
<tr>
<td>No Answer</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Don't Know</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

(4:68-69)
them. It was the conclusion of the study, therefore, that television could become an accepted educational medium. Those who had experienced either seemed to favor it or to revise previously adverse opinions at least to neutral ones. The professors felt that their students did better, and the students seemed to feel that their professors gave better, more informational lectures.

The fourth problem area with which Penn State concerned itself in its television instruction analysis was the feasibility of establishing the program on an extensive and long-range basis; it is here that the practical considerations of teaching with television were treated. When the project was begun in 1954, the University installed the Vidicon-type camera largely for economic reasons. A relative question here was, would they, in light of technological advances, continue to be economical. Subsequent research has proved that they are.

The concern here, hence, is with material problems. Some of these are: whether or not new buildings should be constructed to house television equipment; how to co-ordinate television presentations; maintenance costs; and comparative costs of courses in relation to the student and the institution, as opposed to courses taught in the conventional manner.
### TABLE 4

STUDENT PREFERENCES FOR DIRECT OR TELEVISED INSTRUCTION WITH RESPECT TO TRADITIONAL OR ADAPTED TV INSTRUCTION

<table>
<thead>
<tr>
<th>Original Condition</th>
<th>Prefer TV</th>
<th></th>
<th>Prefer Direct</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Per Cent</td>
<td>No.</td>
<td>Per Cent</td>
</tr>
<tr>
<td>Adapted Section</td>
<td>37</td>
<td>62</td>
<td>22</td>
<td>38</td>
</tr>
<tr>
<td>Lecture-Blackboard Section</td>
<td>46</td>
<td>52</td>
<td>42</td>
<td>48</td>
</tr>
<tr>
<td>Totals</td>
<td>83</td>
<td>57</td>
<td>64</td>
<td>43</td>
</tr>
</tbody>
</table>

(4:79)
Table 5 provides a comparison of four courses of student-credit-unit costs of conventional and televised instruction. This table is most useful in that it pictures the fact that televised courses are cheaper for the student, and hence for the institution, than the conventional lecture courses. Though the initial costs are higher, as the televised course reaches more and more students, its expense diminishes. Table 5 illustrates the cost, both for TV and conventional, for the same four courses as in Table 6. Because the system installed proved mechanically proficient, because televised courses could be handled with little trouble, and because, on a cost basis, television was a relatively cheap educational tool, Pennsylvania State University concluded that it did fulfill the criterion of feasibility. Because of this, the present system is being enlarged and research into future possibilities is being continued.

If for only one reason, the Penn State report is valuable. It points up four criteria upon which educational television can be judged. And the results of the university's experiments--grades did not fall off when courses were televised and in some cases were improved; television was an appropriate medium for presenting formal courses; those who had experience with it, both students and faculty, accepted it; and it was
TABLE 5

COST ANALYSIS FOR FOUR COURSES

<table>
<thead>
<tr>
<th>Item</th>
<th>Psychology</th>
<th>Accounting</th>
<th>Sociology</th>
<th>Air Science</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conventional</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Instruction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructors</td>
<td>$20,825</td>
<td>$7,100</td>
<td>$5,666</td>
<td>$50,000</td>
</tr>
<tr>
<td>Graduate Assistants</td>
<td>1,400</td>
<td>1,400</td>
<td>4,108</td>
<td>---</td>
</tr>
<tr>
<td>Hourly Labor</td>
<td>---</td>
<td>---</td>
<td>500</td>
<td>---</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>$22,225</td>
<td>$8,500</td>
<td>$10,274</td>
<td>$50,000</td>
</tr>
<tr>
<td><strong>Television</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Instruction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructors</td>
<td>$7,985</td>
<td>$1,713</td>
<td>$2,100</td>
<td>$20,000</td>
</tr>
<tr>
<td>Graduate Assistants</td>
<td>1,206</td>
<td>2,800</td>
<td>800</td>
<td>---</td>
</tr>
<tr>
<td>Room Proctors</td>
<td>374.50</td>
<td>450</td>
<td>2,070</td>
<td>---</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>$9,565.50</td>
<td>$4,963</td>
<td>$4,970</td>
<td>$20,000</td>
</tr>
<tr>
<td><strong>Operating</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.63/hr)</td>
<td>$5,114.88</td>
<td>$2,557.44</td>
<td>$2,557.44</td>
<td>$2,557.44</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>$14,680.38</td>
<td>$7,520.44</td>
<td>$7,527.44</td>
<td>$22,557.44</td>
</tr>
<tr>
<td><strong>Differences</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| (in favor of television) | $7,544.62 | $979.56    | $2,746.56 | $27,442.56  | (4:103)
TABLE 6

COMPARISONS OF STUDENT-CREDIT-UNIT COSTS
OF CONVENTIONAL AND TV INSTRUCTION

<table>
<thead>
<tr>
<th>Course</th>
<th>Total Students</th>
<th>Credits</th>
<th>Total Units</th>
<th>Net Cost Conventional</th>
<th>Net Cost TV</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychology</td>
<td>1,226</td>
<td>3</td>
<td>3,678</td>
<td>$6.04</td>
<td>$3.99</td>
<td>$2.05</td>
</tr>
<tr>
<td>Accounting</td>
<td>429</td>
<td>3</td>
<td>1,287</td>
<td>$6.60</td>
<td>$5.84</td>
<td>$0.76</td>
</tr>
<tr>
<td>Sociology</td>
<td>466</td>
<td>3</td>
<td>1,398</td>
<td>$7.35</td>
<td>$5.38</td>
<td>$1.97</td>
</tr>
<tr>
<td>Air Science</td>
<td>1,620</td>
<td>2</td>
<td>3,240</td>
<td>$15.43</td>
<td>$6.96</td>
<td>$8.47</td>
</tr>
<tr>
<td>Totals</td>
<td>3,741</td>
<td></td>
<td>9,603</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student-Credit-Unit Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Averages</td>
<td></td>
<td></td>
<td></td>
<td>$9.48</td>
<td>$5.44</td>
<td>$4.04</td>
</tr>
</tbody>
</table>

(4:103)
a feasible aid, both mechanically and financially-point to one conclusion: when properly studied, prepared, and undertaken, television is an effective educational tool. It does work, and it does help to solve the problem of too many students in proportion to too few qualified teachers.

A Use of Closed-Circuit Television at University of Akron

Dambrot (1972) noted that the department of Psychology at the University of Akron, in the three academic quarters during 1970-1971, 3,700 students enrolled in General Psychology, a 5-quarter-hour freshman-level course. The department does not have a large enough faculty to teach this course by conventional methods. They have been, and are, dependent on a television presentation. Only four direct teaching personnel are involved in the course: the TV lecturer, a TV course administrator, and two graduate assistants. Behind the scenes are scores of supporting personnel: a TV producer-director, electrical engineers and maintenance personnel, tape operators, student proctors, and computer center personnel. The General Psychology course content is presented by a combination of TV lecturers, a reading book, voluntary discussion sections, and individual videotape replay and review. The lecture tapes are presented over a closed-circuit TV system to students meeting regularly in classrooms. The course
is usually offered at three or four different times. The University of Akron now has 32 classrooms equipped for TV reception. These classrooms are located in seven university buildings and arrange in size from 35 seats to 267 seats. Over 2,900 students could possibly be reached by one closed-circuit TV tape presentation in any given hour. TV classrooms are supervised by one or two undergraduate student proctors paid at a minimum hourly rate. The proctors' function is to turn on and tune the TV receivers, record student attendance, and maintain quiet in the large TV classrooms. Small classrooms may be conducted without supervision. The television lecturers are supplemented by a book of readings which allows the student contact with the reality of scientific publication in the hoped that it will be more real and stimulating than the predigested material so often found in textbooks. Six to eight voluntary conferences are scheduled per week. The purpose of the conference is to answer questions from the TV lectures, and to review and discuss reading assignments. In addition to conference sections, once or twice a quarter the TV lecturer meets with students in live question and answer sessions. These meetings have been very popular with students and have produced a lively interchange of dialog. Students need the opportunity to see the face on the TV receiver in living
color. The reality of the TV professor also helps to dispel legend and rumor. In a television test, these multiple-choice question items on the cards are projected over the TV receivers. Each item is shown for 40 seconds and read by the TV lecturer. At the end of the test each item is visually shown again for 20 seconds. This second projection gives the student an opportunity to check or change his answers. The students in a mass TV class need the security of a structured and well organized course. So all students are given a course outline the first day of class detailing by date and title TV lectures, reading assignments, test dates, office hours, voluntary discussion classes, TV tape replay hour, and the rules and procedures of the course including the test points for letter grade of A, B, C, D or F. It is important to convey to students that they will be graded fairly and not lost in the multitude of numbers. Closed-circuit television equipment has not been adequately maintained and replaced in the last 10 years. University budget committees have been at times unable to reinvest the profits from TV instruction into expensive yet necessary equipment purchases. The closed-circuit system at the University of Akron is still in the black-and-white era and has not entered color television. It is difficult to maintain fine tuning on the classroom TV receivers (200 of them) and keep them in
a state of constant operation. Students in the 1968 survey appeared to be satisfied specifically by the course content, the TV lectures, the voluntary discussion classes, the TV method of testing, and the predeterminded grading curve. Dissatisfaction centered on the quality of the TV picture, the noise level of the TV classroom. After the survey, corrective measures were taken to meet the areas of student dissatisfaction.

Closed-Circuit Television as A Medium of Instruction at New York University, 1955-1956

The experimentation had the broad purpose of enabling New York University to join with other institutions of higher learning in the attempt to discover as soon as possible the potentialities of closed-circuit television for higher education. In the background were the rising tide of students, the coming shortage of well-educated college teachers, and the problem of how best to use the talents of the excellent teachers who will be available. The course in the Literature of English was chosen to provide in the same department an opportunity for closed-circuit television experimentation.

A bulletin published by the University of Minnesota College of Education points up some factors which caused the University to install its own closed-circuit system. One of them was enrollment:
The College of Education at the University of Minnesota has been hard pressed to handle enrollments and to keep pace with everincreasing demands for more teachers. It has looked to closed-circuit television as one means of providing instructional experiences to larger numbers of undergraduate students in teacher education. (34)

Minnesota's problem was the same as that of the University of Chiangmai---too many students, too few teachers. To solve this, it installed its own television system. Considered by the University was the fact that television improves the quality of demonstrations, provides uniform experience for all students, permits the close-up view of specific factors, permits the recording and preservation of excellent demonstrations and lectures. Television was considered a teacher in its own right.

Survey of Local School

Before survey the local school, the following procedures were used:

- Preparation of the basic information sought.
- Selected the multi-media centers or the schools used television.
- Consideration the results of the survey in order to secure adequate background to plan for the closed-circuit system at
The Basic Information Sought

(1) Brief situation
(2) Personnel - This is concerned with numbers, qualification, duties, and responsibilities.
(3) Financing Management - In respect to source of income, expenditures, and budgeting.
(4) Programs and productions - in regard to subjects presentation.
(5) Equipment
(6) Problems - Concerning some general problems.
(7) General comments

Selected the Multi-Media Centers or the Schools Use Television in Classroom

(1) Bret Harte Junior High School
(2) Beverly Hills Junior High School
(3) Northridge Junior High School

Considerations from the Survey

Bret Harte Junior High School

(1) This school is in the area of down town Los Angeles, the students in this school are Black. Television can help students learn more than they know from classroom and they are interested in the program so much. Some students cannot read so they prefer to learn History via television more than from the book.
The program was recorded to cassette video tape from TV program of Education Channel 28 or 58 and playback for classroom, which teachers requested for their class.

(2) Personnel, 1 teacher - Instructional Technology Education background, which the duties are recording the program that instructors requested or the program that she considered that it is useful, and set the classroom for students, set equipment for students and instructor. Student aids - taught by teacher to run equipment for other classes, tape programs, and keep schedule charts current.

(3) Financing management: source of income from regular school fund and school district
Expenditures - purchase of new equipment, repair equipment

(4) Programs and productions: usually record TV programs which requested, EX. for American History or the other programs. Sometimes used portapack-live campus productions, in class activities such as language, gym.

(5) Equipment:

- 2 cassette video tape recorders (VCR)
- 1 portapack video tape recorder and portapack camera.
- 2 video cameras (1 Sony, 1 Panasonic)

both of them are black and white
10 TVs' to be used in classrooms as monitors for VCR
1 reel to reel video tape recorder
1 switcher (can switch 3 cameras)
1 microphone
1 flood light
(6) Problems: The school faced with many problems as following:
   1. Keeping equipment in working order, repair take time and expensive.
   2. The shortage of money to buy more VCR machines and tape because it had to keep video tape current and sorted-out.
(7) General Comments: When TV programs are worthwhile and coincide with current curriculum, the video tape program is excellent as it allows students to have more visual understanding and variety in learning experience. For example, in science it helps them to see more experiments, look thru a microscope (all of the same time)
Beverly Hills Junior High School
(1) The school is in the area of Beverly Hills. The media service is broadcasting. There was their own studio.
(2) Personnel: 1 technical engineer
   1 material specialist
1 distribution director
1 AV specialist
1 secretary and
student aides

(3) Financing management:
source of income - school district
expenditures - purchase of new
equipment, repair
equipment

(4) Programs and productions: Record TV
program from Educational Television, record in their
own studio in English class discussion and drama.

(5) Equipment:
1 production switcher
1 distribution switcher
1 cable channel E switcher
2 vedicon cameras
2 image orthicon cameras
1 Century lighting system
2 turntables
1 tape recorder
6 video tapes
Approximate 25 monitors

(6) Problems: Money is broken and quality of
equipment make the picture not clear enough.

(7) General comment: Atmosphere is family,
everyone is nice, all of these things make people in the studio or in the media center do the good job.

Northridge Junior High School

(1) The school is in the area of San Fernando Valley, it is a multi-media center which include with library, AV center and TV center.

(2) Personnel: 2 librarians (both of them got the credential of library)
    1 media technique adviser
    2 clerks (1 library clerk, 1 media clerk)
    2 aides (1 full-time, 1 part-time)

(3) Financing management:
    source of income - school district
    expenditures - repair equipment, purchase equipment

(4) Programs and productions: Record TV program from Educational Television in many subjects such as American History, and live production in Football game, or the reading classes.

(5) Equipment: 1 video tape recorder
    1 camera
    2 monitors
    2 video tape cassettes
    1 microphone
Problems: the multimedia center needs more qualify equipment but there was not money to purchase.

General comment: students are interested in TV program very much. Students sustain motivation to learn in the TV classroom, and also provide more varied experience for the student as he is learning.
CHAPTER III

POINTS OF VIEW OF A CLOSED-CIRCUIT TELEVISION

Closed-Circuit Television (CCTV)

Closed-circuit television transmits signals via wire, specifically, coaxial cable. The systems vary from the smallest unit used in a school to the larger ones used in the whole school district or even in the whole town. The fully developed stage of CCTV is Cable Television (CATV) which can transmit signals directly from the station to home receivers via cables.

The chief advantage of CCTV over broadcast television lie in less operational and installation cost and its ability to transmit more than one channel at the same time. This was evidenced from experiments since the early 1950's by various colleges and universities such as Michigan State University in introducing formal course work over CCTV. Another advantage of CCTV is that it falls outside the jurisdiction of the Federal Communi­cation Commission.

For cable television or CATV (Community Antenna Television), Silverstone (28) concludes its advantages as follows:

(1) Cable television has an abundance of
channels providing greater channel capacity.

(2) Ghost-free reception permits improvement in poor reception and fringe areas.

(3) Equipment conformity is not a distinct problem.

(4) Leased system is less costly to education.

(5) FCC license is not needed.

(6) Starting with 24 channels, CATV can be expanded to 36 or more.

(7) Local program origination is beneficial to school for public relations.

(8) A network of licensees can be established through state interconnection.

(9) Two-way communication via CATV is now feasible.

System Planning

The simplest type of closed-circuit television system consists of two units of equipment, a television camera and a television receiver. The camera and receiver are connected by a two-conductor wire called a coaxial cable. (Fig. 1)

Complex Systems—Several Receivers is a relatively simple matter to add more television receiver to the simple system and a line amplifier. (Fig. 2)

Complex Systems—Several Cameras. There are several cameras with one or more monitors. When the
Fig. 1. The basic closed-circuit television system.

(35:17)

Fig. 2. Addition of a line amplifier to the system to amplify the signal in the cable.

(35:18)

Fig. 3. A system using three cameras and a single monitor.

(35:19)
cameras are all in operation at the same time, each of the several cameras must be selected at will to feed one group of monitors by a camera switcher. (Fig. 3)

Television Studio Equipment

The Camera  The television camera is the most important single production element. All other production elements are geared to the physical and electronic characteristics of the camera.

There are two major types of broadcast television cameras:

(1) the monochrome, or black-and-white, camera, and
(2) the color camera.

There are three types of monochrome cameras, as determined by the camera pickup tube used:

(1) the 3-inch or \(\frac{4}{3}\)-inch imageorthicon camera,
(2) the vidicon camera, and
(3) the Plumbicon camera.

Each camera consists of three basic parts:

(1) the camera itself,
(2) the viewfinder, and
(3) the lens or lenses.

The color camera contains three channels for each of the three additive (light) primary colors: red, green, and blue. These channels are called chrominance channels. Most cameras also contain a fourth channel, the
luminance channel. The luminance channel provides a monochrome picture that gives the color picture its crispness and also supplies the signal for monochrome receivers.

A complex internal optical system prepared the incoming image for the chrominance and luminance channels. The main parts of this system are

(1) the prism, or beam-splitter, which splits the incoming image into one image for the luminance channel and one image for the chrominance channels;

(2) mirrors, which direct the light image into the various parts of the optical system;

(3) dichroic mirrors, which separate the light image into red, green, and blue images;

(4) relay lenses, which keep the images sharp until they reach the pickup tubes; and

(5) color filters, which correct the color for the pickup tubes.

The three basic electronic characteristics of all cameras are

(1) operating light level,

(2) burn-in, and

(3) contrast.

The studio cameras are usually put on different camera mounts:
(1) tripod dollies,
(2) studio pedestals, and
(3) studio cranes.

Lenses There are two basic types of television lenses:
(1) fixed-focal-length lenses, or turret
lenses, on which you cannot change the
angle of view, and
(2) variable-focal-length lenses, or zoom lenses
which allow a continuous changing of the
angle of view.

Important optical characteristics of television
lenses are
(1) focal length or zoom range,
(2) focus,
(3) F/stop, and
(4) depth of field.

The turret lenses come in two lens types: the
16mm-film type and the 35mm-film type. All image-orthi-
con lenses use 35mm type; most vidicon, Plumbicon, and
color cameras use the 16mm type. However, some of these
cameras can also operate with 35mm lenses.

With the exception of the TK-42 camera, which
has a lens turret, all color cameras have zoom lenses.

As with turret lenses, which are grouped into
studio and field lenses, the zoom lenses vary in zoom
range for studio and field use. Some zoom lenses come
equipped with a range extender, which increase the zoom range.

Zoom lenses can be operated either by manual zoom and focus controls or by motor-driven servo controls.

In general, zoom lenses are slower (larger minimum diaphragm opening) than turret lenses.

Audio Television audio is a major part of television production. In general, good television audio is difficult to achieve. Varying distances from moving sound sources to microphones and the requirements of the camera to keep boom microphones and their shadows out of picture range influence audio quality considerably. Inevitable studio noises add to audio problems.

There are two types of television microphones:

(1) mobile microphones and
(2) stationary microphones.

Mobile microphones include
(1) boom microphones,
(2) hand microphones,
(3) lavalier microphones,
(4) wireless microphones, and
(5) long-distance microphones.

Stationary microphones include
(1) desk microphones,
(2) stand microphones,
(3) hanging microphones, and
(4) hidden microphones.

Recorded sound is widely used in television operation, especially music and sound effects records and special prerecorded audio portions on electrical transcriptions or audio tape.

**Lighting**  In all television lighting, the photographic lighting principle of key light, back light, and fill light is used. Additional lighting sources, especially background light and side light, are used to enhance the over-all lighting effect.

In general, vidicon cameras need twice as much light as the monochrome I-O or Plumbicon camera; color cameras need three times as much light. Approximate base-light levels are set at 100 foot-candles for the monochrome I-O and Plumbicon cameras, 200 ft-c for the vidicon camera, and 300 ft-c for the color camera. Base-light levels may vary considerably, depending on the general contrast range and on individual lens openings.

Fresnel spotlights are the most useful instruments in television lighting. Scoops are used for fill light. On remote telecasts, quartz scoops may become the principal light sources.

In lighting for color television, dense shadow areas should be made transparent with fill light, and extremely bright areas should be toned down. Color
temperature is an important factor in color lighting, since it affects the "tint" of the over-all scene. Faces and other skin tones should be lighted as evenly as possible; very little, if any, dimming should be done with lights used for performers or performing areas.

Since operation time and manpower are at a premium in television, close attention must be paid to the original placement of the lighting instruments.

Follow three steps to simplify lighting operations:

(1) Divide the studio into several major performance areas.

(2) Hang all lights so that they can serve multiple functions. This procedure will help to illuminate adequately all performance areas.

(3) Have all lights flexible enough to allow quick and easy lighting changes. Minor light changes should be possible simply by rotating and tilting the light instrument, rather than by repositioning it on the grid.

Once the lights are hung in strategically useful places, routine shows should be put into those performance areas that can be lighted most quickly and easily.
Video Tape Recording

In the video tape process, electronic impulses of television pictures and sound are recorded on a special magnetic video tape, which can be played back, thereby converting the recorded signals into pictures and sound. There are two basic types of video tape recorders:

(1) broadcast video tape recorders, using 2-inch tape and the transverse scanning system (sometimes called "quad-head" machines), and

(2) closed-circuit machines, employing the helical, or slant-track, recording system.

There are four separate tracks on the broadcast 2-inch video tape:

(1) the video signal,
(2) the audio signal,
(3) the control track, and
(4) the cue track.

Editing can be accomplished either mechanically, by cutting the tape physically and splicing it with a special video tape splicer, or electronically, using a special electronic editor.

Whenever video tape is used, special video cuing systems must be employed to allow split-second timing,
necessary for all television operations. There are three major video tape cuing systems:

(1) the beeper system,
(2) the video cue leader, and
(3) the tape timer.

Video tape can be used for both monochrome and color programs in three major ways:

(1) to record entire live television presentations,
(2) to record show segments, and
(3) to record show material at remote locations.

Organizing the Classroom

The ability to see, to hear and to react are basic needs for learning. The classroom should be organized for effective use of television and for maximum learning conditions. This implies comfort, writing surfaces, and some room for the movements required in group activities. Some of the physical features and environmental factors are concerned in this section.

Television Set

The size of the screen will affect both the seating arrangement the number of sets needed for a particular group. Screens of 21 to 24 inches in size are usually recommended. The sets must be mounted high
enough good viewing. The minimum height should be about 5 feet 6 inches from the floor to the center of the screen; greater height is required for students in the upper grades. If sets are mounted on mobile carts, the carts should have large casters and long, heavy-duty extension cards. Sound projection is directional and must be "aimed" at the viewers.

Room Lighting

During the telecast the room should not be darkened. Note talking, work-along activity, and textbook referral are sometimes required of students by the studio teacher during the telecast lesson. Adequate lighting is then essential. To reduce glare on the television screen, move the set away from the window or tilt it downward. Paint or curtains over windows will also help.

Seating

The size of the television screen determines how far away from and how close to the set the students can sit and still see the picture properly. In planning the seating arrangement, the nearest chair not less than 8 feet from the television screen and the farthest not more than 21 feet from a 21-inch screen, with a peripheral limit of 1 foot of distance for each inch in screen size. Stagger seating will allow lower placement of the image than indicate in Table 7 and Table 8.
<table>
<thead>
<tr>
<th>Size of television tube</th>
<th>Maximum viewing distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>17&quot;</td>
<td>14' - 9&quot;</td>
</tr>
<tr>
<td>19&quot;</td>
<td>15' - 2&quot;</td>
</tr>
<tr>
<td>21&quot;</td>
<td>19' - 0&quot;</td>
</tr>
<tr>
<td>23&quot;</td>
<td>19' - 4&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>21' - 5&quot;</td>
</tr>
</tbody>
</table>

(100:32)

<table>
<thead>
<tr>
<th>Size of television tube</th>
<th>Seat row spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>17&quot;</td>
<td>3'0&quot;, 4'4&quot;, 5'2&quot;</td>
</tr>
<tr>
<td>19&quot;</td>
<td>5' - 6&quot;, 4' - 2&quot;, 3' - 9&quot;</td>
</tr>
<tr>
<td>21&quot;</td>
<td>5' - 8&quot;, 4' - 4&quot;, 3' - 10&quot;</td>
</tr>
<tr>
<td>23&quot;</td>
<td>7' - 1&quot;, 5' - 5&quot;, 4' - 10&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>7' - 2&quot;, 5' - 6&quot;, 4' - 11&quot;</td>
</tr>
<tr>
<td>25&quot;</td>
<td>8' - 0&quot;, 6' - 1&quot;, 5' - 5&quot;</td>
</tr>
</tbody>
</table>

(100:32)
height of the image placed at the maximum vertical angle for student viewing comfort (30°). The number of viewers the various viewing areas will accommodate type of furniture and spacing. (Table 9)

The horizontal viewing angle. A line of vision not more than 40° from the axis is the maximum angle recommended for viewing most material without objectional distortion.

All educational material to be viewed on television should be prepared the standards of legibility. The following maximum distances require these minimum legibility standards in Table 10.

Environmental Factors

The classrooms also have desirable characteristics as follows:

(1) All ceilings have acoustical tile.
(2) All rooms have mechanical ventilation.
(3) Venetian blinds running in channels provide for control of external light.
(4) Fluorescent lighting units are mounted against the ceilings and minimize reflections on the faces of television receivers. The units are on several circuit so that the lighting level can be varied if necessary.
(5) Moveable chairs have been provided which
<table>
<thead>
<tr>
<th>Size of television tube</th>
<th>Chair 3'0&quot; spacing</th>
<th>Tablet arm chair 3'0&quot; spacing</th>
<th>Tablet arm chair 4'4&quot; spacing</th>
<th>Desk and chair 5'2&quot; spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>17&quot;</td>
<td>32-34</td>
<td>21</td>
<td>20-23</td>
<td>16-18</td>
</tr>
<tr>
<td>19&quot;</td>
<td>36-38</td>
<td>22</td>
<td>20-26</td>
<td>20-21</td>
</tr>
<tr>
<td>21&quot;</td>
<td>52-54</td>
<td>31</td>
<td>31-36</td>
<td>24-29</td>
</tr>
<tr>
<td>23&quot;</td>
<td>54-56</td>
<td>31</td>
<td>36-38</td>
<td>24-29</td>
</tr>
<tr>
<td>24&quot;</td>
<td>64-72</td>
<td>39</td>
<td>41-52</td>
<td>33-34</td>
</tr>
</tbody>
</table>

(100:35)
TABLE 10

SHAPE AND SQUARE FOOTAGE OF VIEWING AREAS

<table>
<thead>
<tr>
<th>Size of television tube</th>
<th>Average Sq. FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>17&quot; and 19&quot;</td>
<td>155</td>
</tr>
<tr>
<td>21&quot; and 23&quot;</td>
<td>260</td>
</tr>
<tr>
<td>24&quot;</td>
<td>325</td>
</tr>
</tbody>
</table>

(100:34)
will permit flexible seating arrangement.

(6) All rooms have power outlets at convenient points for television receivers.

(7) The rooms are painted in pastel shades, rather than in somber colors.
CHAPTER IV

THE PROPOSE PLAN FOR ESTABLISHING A CLOSED-CIRCUIT SYSTEM AT CHIENGMAI UNIVERSITY, THAILAND

In light of the information from the review of literature and the ideas from visiting the selected schools, a plan for establishing a closed-circuit system at Chiengmai University, Thailand was developed. The plan consists of 4 parts:

(1) Studio and control room layouts
(2) Equipment
(3) Staff Requirement
(4) Financial

Studio and Control Room Layouts

The television studio is the center of creative abilities. A permanent studio for closed-circuit television should be at least 20' X 40', and should have drapery tracks around the wall. These drapery tracks should be set out 18" from the wall in order to allow for scene, prop, and storage and help the acoustic and ventilation of the room. The ceiling should be at least 15' high and made of acoustic tile or other sound-absorbing material. The floor should be polished cement, so that the cameras can dolly smoothly. The light grids can be made from common 1" or 2" plumbers pipe and
should be installed in the ceiling to allow the studio lights to be hung out of the way of studio floor space. With the heat generated by the lights, good airconditioning with soundproofing must be available. The control room should have a doorway access directly into the studio, and a window may be placed between the control room and studio. The control room should be a comfortable size for suitable working conditions and plan for additional equipment may be required at a future date. The raised floor should be built in order to run the cables throughout the control room into the studio. There are many kinds of equipment found in a typical closed-circuit control room, including monitoring devices, the video and audio switching mechanisms, and an intercom system.

**Equipment**

The following equipment is needed:

1. TV camera chain with view finder
2. Lighting and dimmer control systems
3. Sound system and audio tape recorders
4. Monitoring console switcher, audio cartridge, video controls
5. Video tape recorder 2" standard
6. Film and slide chain

**Staff Requirement**

The four necessary areas of personnel:
The following staff will be assigned to each area:

**Administration Staff**
- 1 Director
- 1 Assistant Director

**Program Production Staff**
- 2 Cameramen
- 1 Switcher
- 1 Audio operator
- 1 Floor manager
- 1 Lighting technician

**Supporting Staff**
- 1 Graphic artist
- 1 Photographer
- 1 Secretary
- 1 Clerk typist

**Engineering Staff**
- 1 Chief engineer
- 1 Studio engineer
- 1 Studio technician
- 1 Field technician
Financial

Source of Income

After the plan is set up and approved, the most important step is to finance the plan. The possible sources of financial support are government support, students' tuition fees, union donation.

Expenditure

The expenses of the studio are salary, and wages, purchase equipment, repair equipment, maintenance studio, rent cables.

Since the labor cost in Thailand is low, it does not require a large amount of money to run the studio and all staff members are government employees, the salaries will be paid by the government. However, the equipment costs and equipment supplies will consume the major part of the budget because some of the software is very expensive.
CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

In this study the author has attempted to investigate the relative merits of television as an educational medium, specifically as an aid to be employed in the solving of the educational problem at Chiangmai University, Thailand. Chiangmai University needs to produce manpower in many areas in order to answer the demand of national development; the university is faced with a shortage of instructors and a great number of students which cannot be reached the goals. Some methods must be found by which the present education set-up can be implemented. Television, it seems, provides at least a partial answer to help reduce the present student-instructor ratio.

One consideration in establishing a closed-circuit television system is whether or not television has proven valuable in other institutions of higher education, such as the Pennsylvania State University, Akron University, New York University and Minnesota University, where television's worth as an education tool has been illustrated. Some high schools or junior high schools are utilizing this media to supplement
their regular educational programs. Television is a simple medium, a powerful new means of communication and motivation through sight and sound, with a cost which is not prohibitive. Closed-circuit television seems ideal for schools; it is an ideal creation to aid in Chiangmai University's problem.

Conclusions

From a review of the literature and visits to schools in the area utilizing closed-circuit television, the following conclusions are presented.

(1) Chiangmai University needs to produce supply manpower in many areas. This scarcity of manpower is caused in part by a shortage of instructors. Something should be used to supplement the lack of instructors and to reduce the student-teacher ratio.

(2) Television enables the educator to reach a greater number of students. The effectiveness of closed-circuit television has already been proven in previous studies. In some cases the mean test scores of the students were higher when they received television instruction; even though some cases the mean scores were the same.
(3) Closed-circuit television lessons are more carefully planned and prepared and are more interestingly presented than are usual classroom lessons.

(4) Television is acceptable as an educational tool. Teachers, students and administrators are predominantly in favor of television instruction.

(5) It is feasible to use television for educational purposes. Cost are not prohibitive; TV reduces the cost per unit for the student.

Recommendations

(1) Chiangmai University should begin an investigation into the possibility of televised courses and television instruction.

(2) The University should consider the future expansion of this media for use in other institutions.

(3) In order to assure the quality of the productions and programs, the university should select experienced persons to work in each field of specialization.

(4) To start a high quality studio, purchasing equipment is recommended for the best pieces of equipment manufactured by dif-
(5) The studio should also seek for financial aid from private corporations or other sources although there will be supported from the government and the students' tuition fees.

(6) The studio should work carefully with the university curriculum committee to determine the content of each televised course.

(7) Once the survey is conducted to prove the value of television instruction, a closed-circuit system should be incorporated into the facilities of the university.
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