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Graduate Teaching by TV: The GENESYS Network of the University of Florida

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GENESYS, Cape Canaveral, Florida

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GRADUATE TEACHING BY TV:

THE GENESYS NETWORK OF THE UNIVERSITY OF FLORIDA

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Abstract

To meet the problem of graduate education for working engineers at several sites remote from a main campus. Many solutions have been suggested. From two years experience with one solution, it is clear that competent graduate work at an accredited University can be successfully presented at remote sites via TV.

The largest TV network now used for this purpose is the University of Florida GENESYS: Graduate Engineering Education SYSTEM. GENESYS has four originating studio-classrooms and three additional sites in East-Central Florida capable of receiving programs. Essential to the success of the system is the full system audio talk-back. Each term some 40-50 Graduate courses are presented, in addition to several non-credit short courses each month.

The Need

A critical problem today is the development of graduate engineering degree programs for working engineers. In large metropolitan centers, this need is met by the evening courses taught at the local schools. Disadvantages of these programs are the long lecture period (usually three hours, once a week), and the student driving time to the campus, often in rush hour traffic. Frequently the instruction is done by adjunct, or other part time staff. While their competence is usually adequate, curriculum coordination may be inadequate and student counselling skimpy.

An even more severe demand on a university is to present such a broad graduate program at several remote sites. This was the problem facing the University of Florida which has a main campus in Gainesville remote from the Florida technical concentrations at Daytona Beach, Orlando, and Cape Kennedy. This pattern is typical of many State Universities.

Satellite Campuses Linked By TV As A Solution

The solution developed by the then Dean of Engineering, Thomas L. Martin, Jr., was a TV network linking satellite campuses. Operation began two years ago (April 1965), with studios at the main campus in Gainesville, and at satellite campuses at Daytona Beach, Orlando, and at Port Canaveral, just south of Cape Kennedy. Full-time Professors are permanently resident at these satellite campuses, and courses originate from all campuses. The network carries some 45 graduate courses, mainly in Electrical, Systems, and Aerospace Engineering. Reflecting student needs, fewer offerings are available in Mechanical, Civil, Chemical Engineering and Mechanics. Graduate courses for minor credit are given in Mathematics, Statistics, and Physics. Courses are scheduled from 6:30 A.M. to 10:20 P.M., Monday thru Thursday.

Student participation can be at any of the four studio sites, as well as in auxiliary classrooms at NASA's Kennedy Space Center on Merritt Island, Patrick Air Force Base, and at the Naval Training Device Center (previously the Orlando Air Force Base) just east of Orlando.

Six professors are resident at Cape Kennedy. Daytona Beach and Orlando have two full-time faculty members each. These professors are available for day and evening counselling and research direction of graduate students. As full residence credit is accrued with each course, a complete graduate program can be obtained at any of the GENESYS sites. This, as much as the use of TV, is an innovation of the system and has required new interpretation of conventional academic policies.

With the geographical convenience of nearby TV campuses, the courses meet twice a week for one hour and twenty-five minutes. Better student concentration is noted, as compared with the usual remote site class scheduling of once a week for a paralyzing three hours. Some schedule conflict exists with the traditional three one hour class meetings, used at the Gainesville campus for non-TV courses. With the dispersal of students and resident faculty around the system, a complete sequence of courses for a given student over several years would include some TV classes and some taken live in the studio-classroom.

Present enrollment is 466 students in 598 course registrations. The majority of the students major in Electrical or Systems Engineering, although the number of Mechanical and Aerospace students is expected to increase in the Fall of 1967 with a planned extension of the GENESYS network to West Palm Beach.

Most students at the satellite campuses take one course at a time (330) and some take two (134). Recalling that nearly all students are employed, it is not surprising that only a handful take three or more courses at a time. The video signal is from professor to student; full system audio is used. Thus, communication is no problem to anyone who has mastered any device as complicated as the telephone. Most of the TV doubters - or at least the noisiest in my experience - are those who have never visited a GENESYS campus, but only heard about it!

GENESYS experience with credit courses so far has been with small classes, 5-15 usually - rarely 25 - and one prodigious 56! Friday and Saturday the Short Courses (non-credit) sequences have carried as many as 60, but student talk-back is then much less. It can be argued that the size of the class and the personality of the Professor determine the possible student participation more than the geographical location of the student.

At the Masters Degree level, GENESYS success seems conceded in most quarters. The courses receive full residence credit when taken or originated at any campus.

The final oral exam for the Masters Degree is usually given at the Gainesville campus, but has been given at satellite campuses. There seems no valid objection to TV orals unless the Professor would miss the traditional handshake after successful completion. An emotional request for the student to visit the Gainesville campus "at least once" has been recorded. However, it is beyond the Masters level that system difficulty is encountered. The University of Florida has no degree between the Masters and the Ph.D.. It can be argued that the Engineers Degree as given by Stanford, Cal. Tech, USC and MIT (to name only a few) would be desirable in the GENESYS context. This degree is roughly one full year and a thesis beyond the Masters. It is not widely known, and there is much confusion concerning its name. In addition, it has the stigma in some circles of being a consolation prize for an unsuccessful Ph.D. candidate. However, it is well suited for the employed student who has already received a Masters.

Early in 1966 a program of non-credit Short Courses was initiated for transmission on Friday and Saturday when graduate courses were not scheduled. Thus the entire technical community, including busy management, can benefit from the talent available over the TV system in the professional improvement program.

System disadvantages have been surprisingly few. Lack of eyeball-to-eyeball contact is of course felt, but it can be minimized by the Professor remembering to look into the camera from time to time. Visits to the students on other campuses during the semester are encouraged by the Professors. Transmittal time of notes, problems, examinations, and homework papers is a nuisance, but can be minimized by proper pre-planning. Seminar participation has been a problem. The spectre of "Big Brother watching over you" could be raised by the faculty, but has not caused concern with the present staff. TV sets are located in the offices of the Dean and several senior professors. This easy accessibility of lectures provides education of other professors, and a control on course content and level. Student complaints as to content and pace can be verified directly.

Classroom demonstrations of experiments, oscilloscope faces, and other detail can be improved even for the students in the studio itself as a zoom camera projects to TV viewers in the studio and to the remote campuses.

Present Projection Techniques

The GENESYS TV system has been briefly reported in references 2-4. The technical specifications will not be reported here; rather the system concepts are of interest. Visualization techniques on the TV system include the traditional blackboard as seen with remote operated zoom camera, camera projection of the desk top, and projection of desk top material on a screen to be picked up by the zoom camera. The students are provided microphones

at all classrooms for communication with the Professor and with other students. This important feed-back audio system permits all audio system permits all students in the GENESYS system to hear questions from all campuses. It is fascinating to hear the intrastudent arguments on homework problems during the break period!

Most instruction so far in GENESYS has used conventional wall-mounted chalkboards or the desk top projection of felt pen written material. On the board, larger than usual writing is required. The board can be viewed by one of several fixed cameras, as at Ohio State University (5,6). At GENESYS, as at the new TV system at Southern Methodist University, remotely controlled cameras with pan, tilt, and zoom capability are mounted on the studio rear walls. These cameras can be controlled by professor or by the operating technician. Figure one demonstrates a typical lecture situation using the chalkboard.

An installation at IEM was reported to be completely "self service", with instructor activated multiple TV cameras on the studio rear wall (ref. 7). In addition to large and heavy writing on the blackboard, written material must be grouped in one area rather than strung out over the entire wall. Rapid professorial movement back and forth across the room must also be discouraged. With zoom lens, full wall coverage is possible, but with attendant loss of detail of the material. The problem of blocking from view of the board, then the studio students who cannot see the board directly can view it on one of the two monitors located in the front of the class. With a throat or lapel microphone, the problem of mumbling into the chalkboard is also eliminated. Wireless microphones eliminate the problem of a trailing umbilical cord with its dust and chalk.

As with any projection technique, sufficient time must be allowed for the student to copy before moving on to the next section of the chalkboard. As chalkboards must be erased eventually, recall is not a possibility. A wall roller paper or sheets on a large easel could be used. Because of the contrast problem, a shade of tan, gray or pink could be used. The roller system could be foot treadle operated, even with reverse capability for recall purposes.

As a second projection technique, a camera mounted vertically over a desk has been very popular with the GENESYS professors. With either fixed or zoom lens, this camera picks up material written with larger than usual script by a felt point pen. By buttons on the desk and/or at the technician's console, the transmitted signal can be switched from the desk top projection to the usual face-on picture of the zoom camera at the rear of the studio. Figure two shows a typical view during a discussion from the Professor's chair. The dust and dirt of chalk is eliminated, as is the strain on the professor's feet. Figure two shows a typical view during a discussion from the Professor's chair. In figure three the vertical camera above the desk is projecting material on the desk while the professor comments.

However, there are hazards to this desk method. Since the rest of the desk top is off camera, the temptation is strong merely to transcribe from the professor's notes to the felt pen pad. Direct eyeball contact is

also lost, except for intervals of the studio rear wall camera. An unrelieved hour of watching a dark hand move on a light page could be very anesthetizing. Although the rear wall camera is at the conventional setting, the desk top camera is stopped down for the contrast with white paper, and the contrast problem does not seem serious.

The desk top is a good method for projecting textbook curves or other prepared material which could not be created in real time with enough accuracy. A logical extension by one imaginative Professor is to have the lecture pre-typed in jumbo type and simply slip these cards in place as the lecture proceeds. Typographical errors are thus eliminated, at least at the professor's end. A disadvantage is that the professor may race on too fast for the student.

An ingenious variation of the table top camera was developed by Professor Edward T. Pitkin at the University of Connecticut. He utilizes a theatrical TV studio dolly on a platform behind the professor to view his writing on an inclined drafting board. The professor can be standing, presenting a more graceful switch to the face-on camera at the rear of the studio.

While two-way video might be desirable, it would be prohibitively expensive for the seven classroom network of GENESYS. From two years experience it is our conclusion that it is not needed. Essential, however, is two-way audio. Without talk-back, you may produce a video tape, movie or illustrated book, but you are not engaging in a two-way teaching process.

System Assessment

Proper assessment of a satellite campus TV operation such as GENESYS is difficult because two simultaneous experiments are actually in operation. The first is TV teaching. In the opinion of many of us who have participated for a significant period of time, graduate level instruction by TV is entirely feasible and should be considered a proven concept. Adequate solutions have been found for most initial objections by students and professors. No hope is held, however, for convincing the politician or journalist who criticizes from afar and will not visit the facility nor talk with any of the participants. Since he "knows it won't work", mere data is ineffective. A thousand students and forty professors have found GENESYS TV teaching a workable solution to quality graduate education at geographical sites remote from a major university main campus. The GENESYS experience is in agreement with an older comment: "There can no longer be any doubt that students learn efficiently from instructional television----it is at least as effective as ordinary classroom instruction-----" (Ref. 8).

Rather it is the second phase of the GENESYS experiment which causes concern. The operation of remote satellite campuses can be considered routine for non-thesis Masters Degrees. It is the thesis degree-Master, Engineer (6th year) or Ph.D. which provide the severe test. Thesis supervision

by professors resident at satellite campuses must be permitted and encouraged by university regulation and action. Otherwise the TV system becomes just another off-campus "Masters Mill". It is this administrative confrontation that the most severe problems have occurred in GENESYS. Only with a clear charter for Ph.D. thesis supervision can qualified faculty and students be retained and can research grants be attracted. It is agreed by all that student provision for concentrated research time, either company or contract sponsored or unpaid, is required for an acceptable thesis. The exact length of this "period of concentration" is subject to some question, but unanimity exists for the need of some such concept, as long as it is not merely used as a device to stifle the program. At the present the outlook for GENESYS at the thesis degree level is not encouraging.

In a broad ranging recent overview of the educational uses of television at all levels, Murphy and Gross (Ref. 9) have noted "TV is still far from fulfilling its obvious promise" --- Instructional TV "still occupies a marginal position in American education, despite the ever increasing number of students it reaches." At the University level, they note "despite a variety of demonstrations that TV could help solve the mounting crisis in higher education, faculty resistance continues high-----." "Many experiments have been evaluated with score card simplicity----- (and) conceal the reasons why TV is sometimes useful, sometimes not" (Ref. 8, page 9,12,14).

Future Expansion

It is, after all, time that modern techniques were applied to graduate level education. In the thousand years since the founding of Al Azhar in Cairo, student transportation has progressed from walking to camel-back to the four-on-the-floor Mustang, but the basic mode remains: the student must come to the University. With communication from beyond Mars feasible, it seems time to project the university out a bit farther to the student.

As to the future: It all depends on the budget allocated. The technical possibilities are certainly here. Students should be more than Xerox machines with shoes, so the dreary stenographic reproduction of equation from a blackboard (with at least two error-producing steps involved) can be replaced by instantaneous printing at the classroom or even at the student's console of prepared or real time created notes from the professor's lecture. Student attention can then be directed to comment and explanation of the notes. Computer programming exercises can be done at site by the student, on the direct line to the central computer and the results seen by all and corrected by the Professor.

The Faculty-possibly the most inert body of the university-can even be pulled together on network TV for seminars or faculty meetings. Student oral exams can be transmitted around the network for wider participation. Simultaneous technical symposia have already been held on the GENESYS network, alternating presentations from Gainesville, Daytona Beach, Orlando, and Cape Kennedy.

The current system is limited by state law to engineer-

ing and ancillary courses such as math and physics, but now that the principle has been demonstrated, there is no technical reason why it cannot be extended to education, liberal arts, business administration, medicine, and other fields.

Color TV and two-way TV are not deemed necessary; the present system-wide audio (talk-back) is considered essential, however. Without talk-back the teaching technique is nothing more than a video tape, and student-professor rapport can hardly be expected.

TV classrooms could be installed in contractor facilities, making the student transportation problem even simpler. Some guarantee is needed, however, that the student would not be called from class for phone calls and the usual trivia of industrial life.

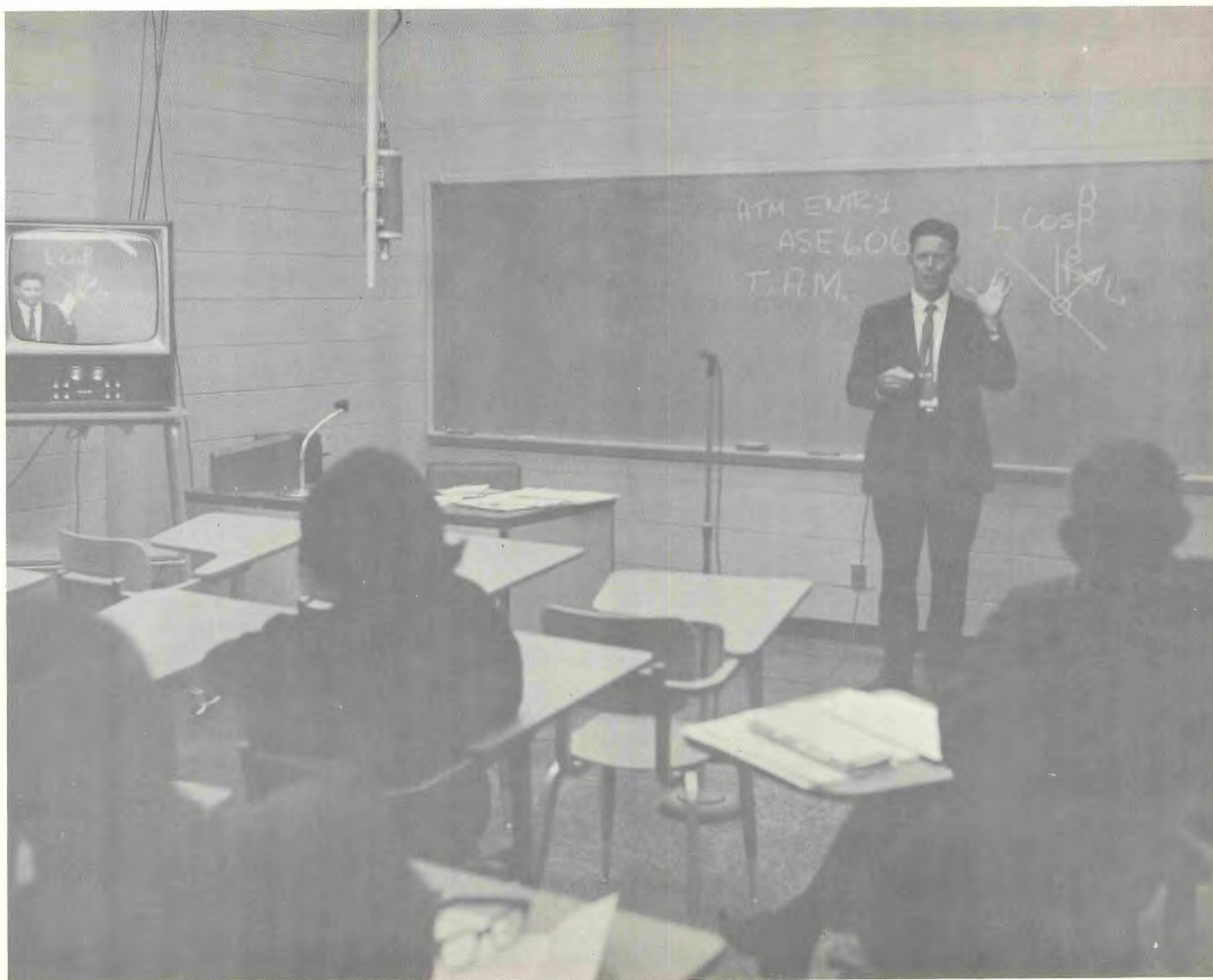
In a 1965 survey of Instructional TV it was concluded: "Most respondents made one over-all point: that the limitations on the use of TV in education are not due to the medium itself but to a lack of imaginative boldness and talent in the people using it" (Ref. 1). These general conclusions are evident in the GENESYS experiment also: it is the academic procedure, not technology, which is limiting.

This admittedly partisan review, of GENESYS, the largest graduate TV system currently in use, is presented for wider discussion. Whatever one may think of contrived acronyms that sound biblical, GENESYS could be the beginning of a new trend in graduate education in areas of geographic dispersion of students and professors.

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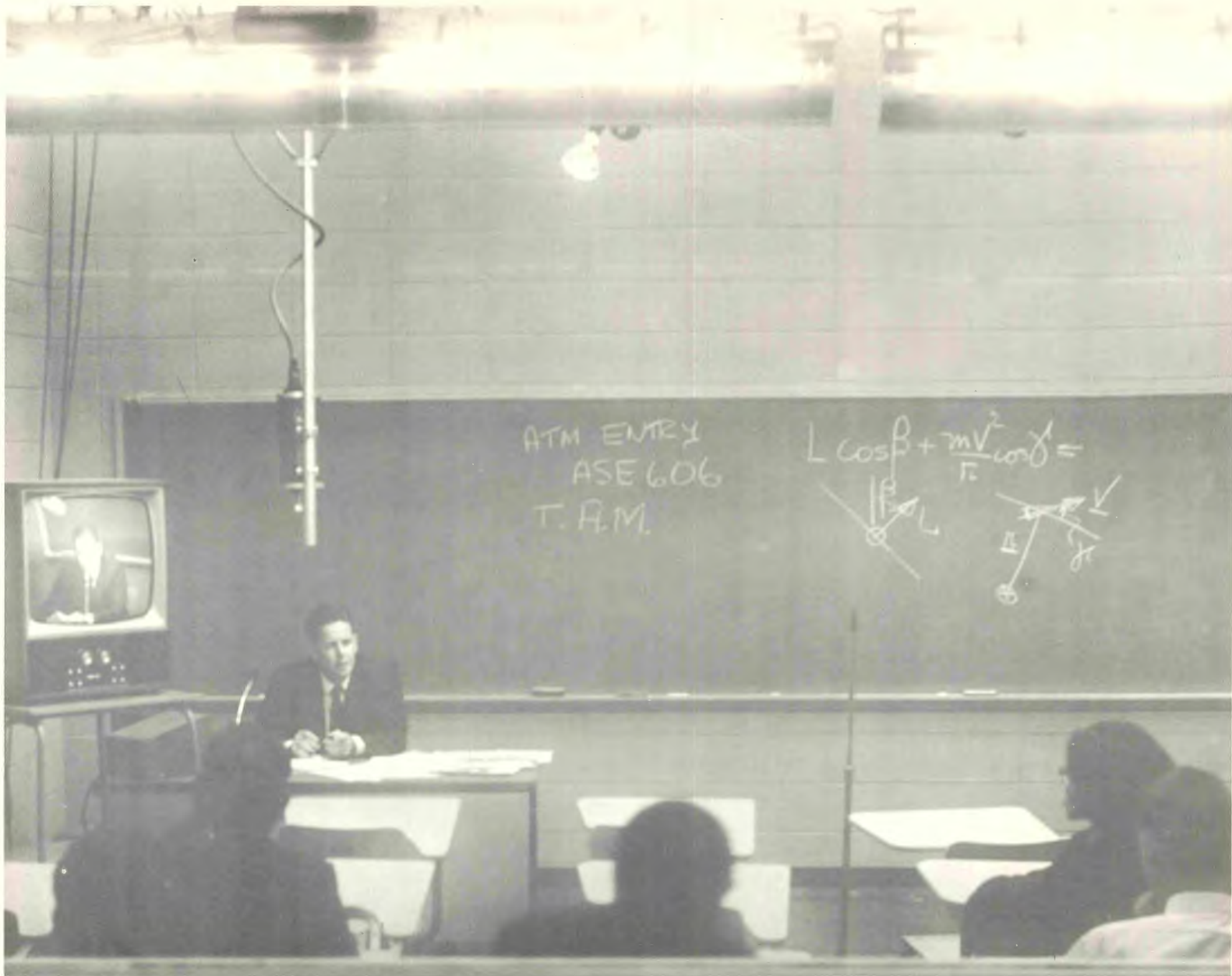
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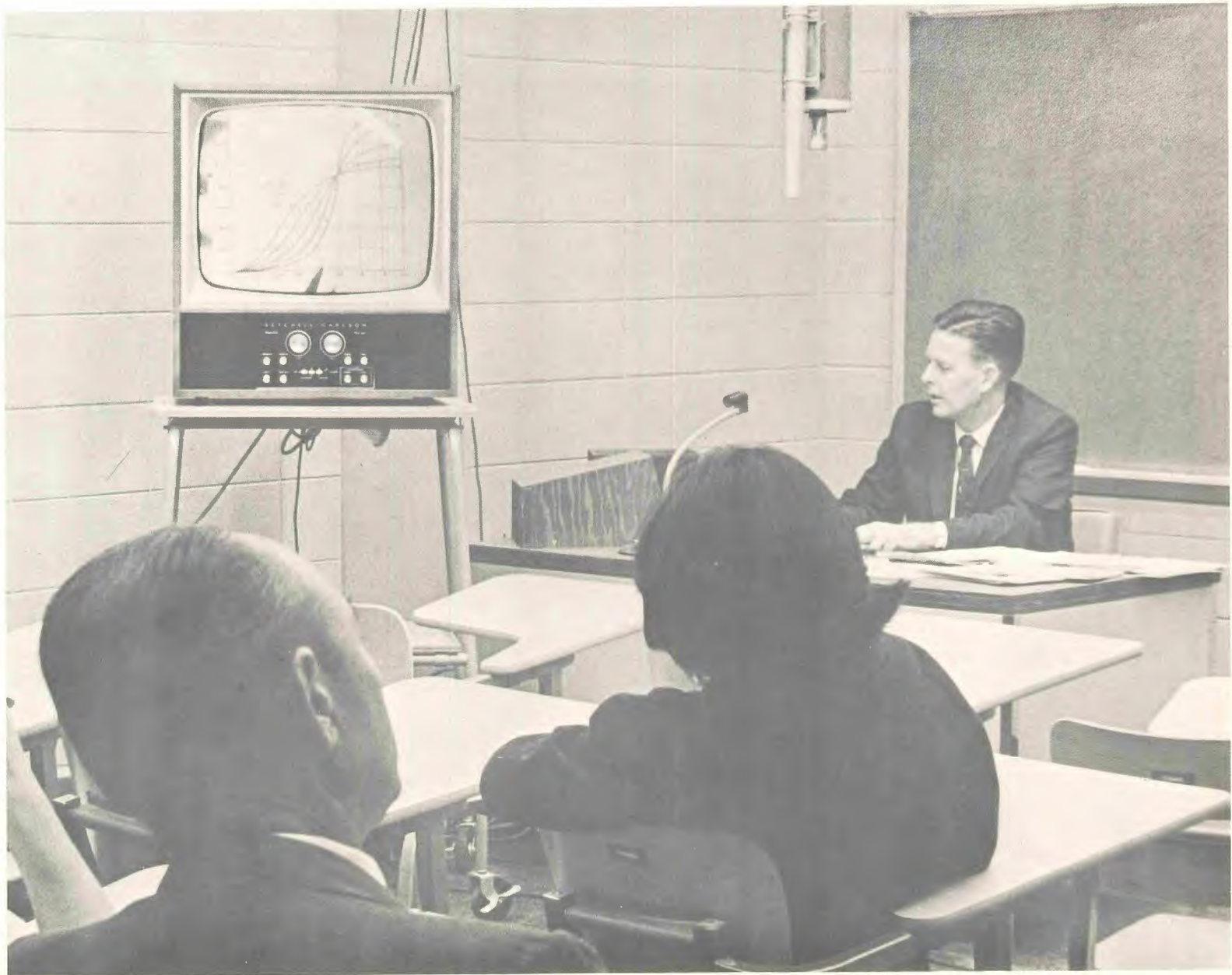


1. TV Projection of Blackboard Material

11-20



2. TV Projection of Professor at Desk (Note Vertical Camera Above Desk)



3. Projection of Desk Top Material by Vertical TV Camera